



celebration of research

# Undergraduate Research Day 2008

*April 26, 2008*

## Student Abstracts

Abstracts are in order by last name of presenter.

**Oral Presentations: Classroom Building,  
University of Wyoming Campus  
1:00 – 6:30 PM**

**Poster Presentations: Family Room, Wyoming Student Union  
4:30 – 6:30 PM**

**Some of the program acronyms you will see in the Abstract Book:**

- **EPSCoR:** Experimental Program to Stimulate Competitive Research
- **WySTEP:** Wyoming Science Teacher Education Program
- **INBRE:** IDeA Networks for Biomedical Research Excellence





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### **Moderators for the Oral Presentations**

*Craig Arnold  
Paul Bergstraesser  
Dennis Coon  
Anthony Denzer  
Carol Frost  
Rubin Gamboa  
Gary Hampe  
H. Gordon Harris  
Janice Harris*

*Stanislaw Legowski  
Carlos Mellizo  
Scott Morton  
Heather Rothfuss  
Scott Seville  
Anne Sylvester  
Glaucia Texieria  
Robert Torry  
Jeff Van Baalen*

### **Electrical and Computer Engineering Senior Design Judges**

*Irena W. Stange, Institute for Telecommunication Sciences, US Department of Commerce (NTIA)  
Barry A. Mather, University of Colorado at Boulder, Ph.D. student  
Andrew A. Catellier, Institute for Telecommunication Sciences,  
US Department of Commerce (NTIA)*

### **Mechanical Engineering Judges**

*Pat Burns, Chairman of the Board, M. A. Mortenson, Washington, D.C.  
Bill Dolling, Retired Vice President Science & Engineering ATK-Thiokol, Inc.,  
Brigham City, Utah  
Annette Lynch, P.E., Jurisdata, Inc., Fort Collins, Colorado*

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*Most important, we thank all of the students and their faculty mentors. Students participating in Wyoming Research Day represent the very best and brightest of UW and the Community Colleges. Without the support and encouragement of dedicated UW and Community College faculty these exceptional students would not have the opportunity to do independent research in such a wide array of exciting areas...we thank you!*



**A Disease of the Other:  
Media and the HIV/AIDS epidemic**  
Andrea Abernathy with Dr. Tracey Patton  
Communication and Journalism  
University of Wyoming  
Oral Presentation

*UW Honors Program*

*Laramie, WY*

The representation of HIV/AIDS in the media has fluctuated since the first reported case in 1981. Unfortunately, it has been overwhelmingly depicted as a disease of the Other. This study examines the history of HIV/AIDS in the media and how its representation effects public perception. Additionally, the study shows how several other countries have successfully used the media to their advantage in efforts to inform the public about HIV/AIDS, prevent transmission and combat stigma. Finally, the possible use of similar tactics in the United States is explored.

**Power Nail Puller Attachment for a Hammer Drill**

Brady Adams, Zachary Frame, Jerry Hahn, and Robert Marion with Dr. Dennis Coon  
Department of Mechanical Engineering  
University of Wyoming  
Oral and Poster Presentation

*ME Senior Design*

*Longmont, CO; Rock Springs, WY;  
Yuma, CO; Colorado Springs, CO*

Frontier Barnwood hired Altitude Engineering to design and fabricate a power nail remover in September of 2007. In the fall of 2006 to the spring of 2007, Simple Solutions Engineering designed and fabricated a power nail puller for Frontier Barnwood. However, the design did not work efficiently. Such issues included manual setting of the extraction teeth, power screw issues, and binding in the extraction teeth. Altitude Engineering was given specific design specifications to adhere to: nails to be removed range from 8d to 60d, a cycle time of 15 seconds or less to extract the nail, have a target weight of 10 pounds or less (hammer drill included), and cause minimal damage to the wood.

The Altitude Engineering design is a nail puller attachment for a DeWalt Hammer drill and is divided into three main components: a power screw, a drilling head and a support frame. The power nail puller attachment was fabricated using the University of Wyoming College of Engineering Machine Shop. Compliance testing on the attachment was tested also at the University of Wyoming. The full assembly of the power nail puller attachment and hammer drill is to be delivered to Frontier Barnwood during May of 2008.

## **Social Factors That Contribute to the High Rates Of Sexually Transmitted Diseases in Young Females**

Rosalie Alexander, Carol Cottle, Devon Martin, Natalie Scissons, and Karen Wolf with Dr. Gary Hampe

Sociology Department  
University of Wyoming  
Oral Presentation

*Department of Sociology*

*Laramie, WY*

Recent data shows that Sexually Transmitted Disease rates in young females are the highest in recent history. One in four females are infected with some form of STD. The social factors that contribute to high rates of STD infections in females between the ages of 18-24 are: age, race, substance abuse, social economic status and level of education.

Our research will prove that there is a correlation between our dependent variable (higher STD rates) and our independent variables (age, race, substance abuse, social economic status, and level of education). Current attitudes of young females are that sexually transmitted diseases are not a valid concern, as most teens define sex as intercourse only, when other types of intimate behavior including oral sex can spread some infections.

STDs in women can lead to infertility and cervical cancer as well as other acute and serious conditions. In female's screenings including vaccinations and other preventive strategies for sexually active women are among the highest public health priorities. High STD rates among young women are clear signs that our government and other health based initiatives must continue developing ways to reach those most at risk with increased prevention and safer sex campaigns.

Data gathered from #6647 in the National Health and Social Life in the U.S. will be used in order to test our research question.

## **Analyzing Organic Compounds in Water Through Direct Liquid Injection and Mass Spectrometry**

John Allhusen with Dr. Franco Basile  
Chemistry  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Casper, WY*

Water is a very valuable resource that is essential to every life form on the planet. The industrial growth of our society has caused certain chemicals to be released into natural water supplies. Many of these compounds are organic. Analysis of these compounds in water supplies has been a tedious process in the past. This research focuses on a faster and more accurate method of identifying organic pollutants in water.

Directly injecting liquid into a mass spectrometer equipped with electro ionization is expected to provide rapid identification of pollutants by allowing the use of standard mass spectra database, bypassing tedious sample preparation steps. The organic pollutants used in this proof-of-concept project were; a mixture of xylenes, pentane, trichloroethane, toluene, dicyclohexylamine, dimethyl methylphosphonate (DMMP) and pentadecane. These organics have a wide range of masses and provide a good sample group to test this method of analysis.

Through direct liquid injection the preparation time is decreased along with the actual time of analysis. This presentation will demonstrate the effectiveness of this method.

## **Design of a Variable Pressure Gradient Wind Tunnel**

Shawn Allred, Sean Dunlop, Chad Gagnon and Bryon Riotto with Dr. Naughton  
Mechanical Engineering  
University of Wyoming  
Oral, Poster

EE Senior Design

Laramie, WY

In recent years it has been discovered that the manner in which boundary layers initially develop significantly influences the rest of the flow. There are many situations in which the initial development of boundary layers is in a favorable pressure gradient (FPG) rough surface environment. For instance, the initial development of a boundary layer over a submarine hull is in a FPG rough boundary layer environment. Despite the many applications, FPG rough boundary layers have not been studied sufficiently. For this reason, the University of Wyoming Aeronautical Laboratories (UWAL) is interested in studying these boundary layers. However, UWAL currently does not have a wind tunnel capable of accurately and consistently producing favorable pressure gradients. It is for this reason that it is necessary to design and build a new tunnel to meet the testing needs of the laboratory. This study examines the design and build of a FPG wind tunnel.

## **Characterizing *fshr-1* Suppressor Mutants**

**Using Genetic Mapping and RNAi Tests**

Carly-Ann Anderson with Dr. David Fay

Molecular Biology

University of Wyoming

Oral Presentation

NSF EPSCoR and UW Honors Program

Cheyenne, WY

Hormones play essential roles in human biology by controlling growth, development, and reproduction. Receptors for the two human gonadotropins, follicle stimulating hormone (FSH) and luteinizing hormone (LH), as well as thyroid stimulating hormone (TSH) have a single ortholog called FSHR-1 in the nematode *C. elegans*. The *C. elegans* *fshr-1* gene is non-essential and null mutants show no phenotype. The gene, however, appears to be involved in many biological functions as evidenced by synthetic genetic interactions. When *fshr-1* and certain other genes are simultaneously knocked down, a phenotype results. A genome-wide RNAi screen revealed 114 genes that act synthetically with *fshr-1* to produce several phenotypes.

One synthetic interaction of *fshr-1* occurs with the *fbf-1* and *fbf-2* genes to produce a masculinized phenotype, where hermaphrodites produce excess sperm at the expense of oocytes. This observation loosely connects *fshr-1* with the sex determination pathway. In attempts to understand how *fshr-1* and *fbf* genes work together, the Fay lab performed a series of genetic suppressor screens. Suppressed mutants are fertile on *fbf(RNAi)* plates due to either gain- or loss-of-function alleles in regulatory genes, allowing nematodes to behave as though the *fshr-1* pathway or the *fbf* genes were functional. These mutations are currently being mapped and tested to see whether they suppress other *fshr-1* synthetic phenotypes detected in previous screens and to determine where they may act in the *fshr-1* pathway.

## **Signal Relay System for Directional Oil Drilling**

Evan Anderson, Nolan Bray, and Nick Gurbhoo with Dr. Charles Dolan  
Mechanical Engineering  
University of Wyoming  
Oral Presentation

*Laramie, WY*

The project of interest is a new type of wireless signal relay system for use in directional oil drilling. The system is meant to relay data from the directional sensor at the base of the drill up to a receiver on the surface.

The current method used to relay this information is through sonar pulses through the drilling fluid. But this approach is slow and inefficient, and it requires that the drill be stopped while information is read. This new system should be faster and will be usable while the drill is running.

The Mechanical Engineering aspect of the project is to design the housing, and the power supply system for wireless electronic devices. The power will be generated by the drilling mud flowing through a turbine which drives a generator. A housing consisting of a turbine, generator, and a relay device is placed at distance intervals along the drill pipe. The information will be relayed from one device to the next, all the way from the base of the pipe to the surface. Whether such a system is feasible will be verified by the project.

## **South Water Reclamation Facility: Erie, CO**

Jason Anderson, Luke Darnell, Louis Engels, Matt Scarborough, Tyler Smits  
with Dr. David Bagley and Dr. Mike Urynowicsz  
Civil/Environmental Engineering  
University of Wyoming  
Poster Presentation

*College of Engineering/Senior Design*

*Laramie, WY*

Colorado communities along the front range are growing at a staggering rate. Towns such as Erie, CO have more than doubled their populations in just the last few years. As populations have increased, so has the demand for clean water. However, the amount of available water has not increased along with the population. Like several communities around the country, Erie has decided to start using wastewater for some irrigation needs (parks and golf courses) in an effort to conserve its overall water supply. This reuse water needs to meet higher standards for discharge than normal wastewater. In order to meet these standards, the town of Erie has decided to retrofit an existing wastewater treatment plant with new equipment. We are in the process of analyzing current and potential regulations, evaluating alternatives, and studying the current plant design, in order to determine the most effective treatment method.

### **Reverse Safety Module for Vehicles**

Kim Anderson, Dane Taylor, and Marc Eyre with Dr. Stanislaw F. Legowski  
Electrical and Computer Engineering Department  
University of Wyoming  
Oral Presentation

*Volpi Cupal ECE Senior Design Fund*

*Laramie, WY*

The Reverse Safety Module is an after market addition to increase vehicle safety. The system increases safety by alerting the driver of potential hazards while backing up. At the heart of the design is a Motorola MiniDragon microprocessor that receives data from three ultrasonic sensors placed at the rear of the vehicle, an external temperature sensor, and a digital compass. When the vehicle is in reverse, the microprocessor will evaluate the distance of an object and display it on an LCD screen to alert the driver, as well as provide auditory feedback via a speaker. When the vehicle is not in reverse, the microprocessor will alternately display the outside temperature and vehicle direction. The system will be powered through the vehicle's battery.

### **Electrolysis Unit for Hydrogen Production**

Tyler Andersen and Bryce Kelly with Dr. Stanislaw Legowski  
Electrical and Computer Engineering  
University of Wyoming  
Oral and Poster Presentation

*ECE Senior Design*

*Laramie, WY*

The research conducted in this project is to make a reproducible electrolysis unit to produce hydrogen for general purpose use. As the cost of fossil fuels climb, the need for renewable resources is becoming more apparent. This project's purpose is to advance the feasibility that combustible hydrogen can be produced in consumer homes from an electrolysis unit powered from a renewable electrical energy source such as solar or wind.

Nearly all commercial hydrogen production is achieved through a coal gasification process and the inherent problem is the coal involved. The automotive industry has been focusing more each year on hydrogen powered vehicles and the hydrogen for these vehicles is not any easier to obtain than gasoline because of the reliance on coal for production. Eliminating the coal gasification process and using a renewable electrical source for hydrogen production nearly eradicates the need for fossil fuels.

In recent years, oil and gas companies have devoted a lot of time and money to the research and development of hydrogen technologies and uses. Hydrogen could potentially be utilized not just in the combustion in automobiles but also in heating purposes. This project attempts to prove the feasibility of consumers producing hydrogen fuel for their own multipurpose.

## **Renewable and Nonrenewable Body Products:**

### **The Commodification of the Self**

Christine Aneiros, Jacob Bernatow, Amanda Dunlap, and Christine Henschler with Dr. Hampe  
Sociology Department  
University of Wyoming

*UW Sociology Department*

*Laramie, WY*

Does the commodification of the self have a positive impact on the mental well-being of the donor? Our purpose is to evaluate the mental well-being from donating parts of the self for medical purposes. This issue straddles political, cultural, and religious boundaries, with the ability to undermine the morals of the social structure that has been built upon in the United States.

The affects are mental as well as physical for the donor. Not only do donors have to worry about retaining health, but enduring the mental strain or rewards of giving a part of themselves to someone else or a medical institution. Thus, the independent variable of this research will be the commodification of the self and the dependent variable will concern mental health and well-being. The purpose of our research will focus on who participates in this commodification of the self and the after effects of participation. ICPSR (Inter-University Consortium for Political and Social Research), National Comorbidity Survey: Replication(NCS-R),2001-2003,will be utilized throughout our research.

## **Yugoslavia in World War II: The Death of a Great Inter-ethnic Experiment**

Thomas D. Asmus with Dr. David Messenger

International Studies

University of Wyoming

Oral Presentation

*UW Honors Program*

*Sheridan, WY*

World War II had a profound effect on the post World War I state of Yugoslavia. The deliberate plans of Nazi Germany and her collaborators and allies exploited inter ethnic and religious strife within the state of Yugoslavia to the end of its dissolution as a functional state. These events at least in part caused the dissolution of Yugoslavia in the various Balkan states breaking away from the Second Federation of Yugoslavia which was founded under Tito following the conclusion of WWII. This presentation will focus primarily on the events, people, plans, mentalities and objectives of the various groups within and without Yugoslavia during the Second World War. While this will be the primary focus relation of the events in WWII to events both prior and following this period will also be included to give a greater historical perspective.

## **The Relationship Between Behavioral Inhibition System Sensitivity and Anxiety Disorder Symptoms**

Andrew Thomas Asquith with Dr. Carolyn Pepper & Danielle Maack  
Psychology Department  
University of Wyoming  
Poster Presentation

*McNair Scholars*

*Cheyenne, WY*

Some evidence suggests that Behavioral Activation and Inhibition Scales (BIS/BAS Scale) are predictive of a variety of disorders, but evidence is limited, particularly for adult anxiety disorders. This study will examine the relationship between high behavioral inhibition and the symptoms associated with a variety of anxiety disorders, including obsessive compulsive disorder (OCD), generalized anxiety disorder (GAD), and social anxiety disorder.

We hypothesize that individuals who score high on the BIS scale will report numerous anxiety disorder symptoms. Students at the University of Wyoming enrolled in summer classes will complete the BIS/BAS scales and measures of symptoms of various anxiety disorders, such as the Penn State Worry Questionnaire (PSWQ). If found that inhibition scores relate to a number of different anxiety disorder symptoms, then the BIS might be employed in assessing the risk of numerous anxiety disorders for adults in the future.

## **Expansion Plans for Coal Creek Coffee in Downtown Laramie**

Benjamin James Averill, Elisa Bender, Jamie Capps, Tyler Deboodt, Grant Doherty, Andrew B. Elston, Patti Gunderson, Peter Irey, Eric P. May, Matt Willford, and Scott Wolfer with Dr. Anthony Denzer.

Civil and Architectural Engineering  
University of Wyoming  
Oral Presentation

*Civil and Architectural Engineering*

*Laramie, WY*

The owners of Coal Creek Coffee need to expand and/or redesign their current operation. Students explored several possibilities and developed comprehensive designs based on the architectural and engineering design principles they have learned throughout their undergraduate program. These designs aim to suit the needs of the client, as well as to address the aesthetic questions of designing a new building in a historic area and the technical problems of multi-story, multi-use construction and the building codes. Students were also challenged to go beyond those intentions and very aggressively address issues of energy use and sustainability.

## **Galaxy Evolution: A Local Galaxian Mass-Metallicity Relation**

Megan M. Bagley with Dr. Chip Kobulnicky

Physics and Astronomy

University of Wyoming

Oral Presentation

*NSF EPSCoR*

*Laramie, WY*

This project explores the luminosity-metallicity (L-Z) and mass-metallicity (M-Z) relations for a sample of local star-forming galaxies. Metallicity, the proportion of elements heavier than helium, is correlated with galaxy stellar mass, which underlies a more easily observable correlation with galaxy luminosity. It is thought that galaxian L-Z and M-Z relations evolve with redshift, but direct comparison between studies has been difficult because of the variety of methods used to derive metallicity and the lack of a secure estimate for these relations in the local universe. This local sample will therefore provide a basis for future studies of galaxy evolution.

The results of four different calibrations between spectral emission line strengths and metallicity are evaluated, and local relations are presented using each. Luminosities and masses are derived from both optical *B*-band and *Spitzer* Infrared Array Camera 4.5  $\mu\text{m}$  photometry. The M-Z relations have similar slopes and scatter for both wavelengths. However, we find that the choice of galaxy formation model used to derive stellar masses from photometric data can cause significant offsets in zero point, further emphasizing the need for uniformity of method in studies of the M-Z relation through cosmic time.

## **Third Wheel Politics: Presidential aspirations from the fringe**

CJ Baker with Dr. Michael Brown

Journalism Department

University of Wyoming

Oral Presentation

*UW Honors Program*

*Laramie, WY*

This project is an attempt to look at the lesser-known candidates seeking the U.S presidency in 2008. In most media outlets, third-party and other fringe candidates are given little more than a dismissive snicker. This project aims to give long-shot contenders a chance to tell their stories.

Much of the rhetoric surrounding the 2008 race has focused on the concept of hope. In a sense, fringe candidates are the most audacious form of hope imaginable. They are typically marginalized for a reason – they often have eccentric views, and in the end, they have no chance of winning the presidency. However, this is precisely why their stories are so interesting. These candidates press on – spending time and money in the face of impossible odds.

This project is an attempt is designed to provide voting public an opportunity to learn more about democracy and the many presidential contenders left out of the spotlight.

## **Volcanoes on Jupiter's Moon Io:**

### **An analysis of ephemeris data**

Amber Baltes with Dr. Robert Howell  
Geology and Geophysics  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Riverton, WY*

Analyzing ground-based observation data of volcanoes on Jupiter's moon Io is the primary objective of this research project. With this information a new understanding of volcanism on Io and tidal heating will be obtained. To study the location of each volcano on Io, "mutual event" observations are necessary, where one of Jupiter's moons moves in front of Io. In this research project, previous ground-based data is compared to new and improved ephemeris data from the 1995-2003 Galileo spacecraft mission. This ephemeris data, which is the space latitude and longitude of a planetary object, was collected from NASA's Horizon's web interface. By using the improved ephemeris data and ground-based observations of Io's volcanoes, we hope to understand the evolution, volcanic processes, and time history of volcanoes on Io.

## **Growth and Purification of Recombinant Spider Silks**

Michael Basden with Dr. Patrick Johnson  
Chemical and Petroleum Engineering  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Kemmerer, WY*

Spider silk has many unique physical and chemical properties, which make it suitable for a wide range of applications as a biomaterial for implantable devices. It has superior energy absorbance, elongation, and tensile strength. These traits, combined with the natural biocompatibility and biodegradability of spider silk, make it a promising material for potential tissue engineering applications. However, it is not practical to produce spider silk naturally in any meaningful quantity for biomedical applications, it is necessary to use recombinant spider silk proteins produced from bacterial expression systems.

This project has focused on the growth and purification of the proteins produced by the recombinant bacteria. The bacteria were grown via shaker flask fermentation. The bacteria were allowed to grow until the culture reaches an optical density of 0.8, or about five hours. At this point, IPTG was added to induce protein production. The spider silk proteins yielded from fermentation were then purified via liquid chromatography on an AKTA purifier. Excess salts were removed from the protein solution through dialysis. Upon production of sufficient quantities of synthetic spider silk, we will next explore mammalian cell responses to spider silk films.

**Cloning of Putative Repetitive Domains of the Glycoprotein  
from the Sticky Aqueous Coat of the Spider, *Araneus gemmoides* –  
A Complementary Study Using DNA Libraries**  
Battuya Bayarmagnai with Dr. Randy Lewis  
Molecular Biology  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Ulaanbaatar, Mongolia*

Orb-weaving spiders produce the largest variety of silk types and make an extensive use of them. Sticky spiral flagelliform silk is covered with an aqueous coat which is essential in capturing prey. It has been found that the coat consists of high concentrations of water-soluble organic compounds, high molecular weight compounds such as glycoprotein and low concentrations of different inorganic salts. The glycoprotein has been identified as the only compound that has a sufficiently high molecular weight to act as an actual glue.

Previously, cDNA library of the orb-weaving spider *Araneus gemmoides* was screened for the gene-specific fragments. A repetitive part that consisted of about 500 base pairs was cloned. In this study, cloning of the glycoprotein gene of *A. gemmoides* has been continued. The DNA library has been screened for the glycoprotein gene with a DNA probe specific to the repetitive part of the gene. Collected clones were analyzed which revealed a 900 base pair repetitive part of the glycoprotein gene.

This result was consistent with the results obtained from another orb-weaving spider *Nephila clavipes*. It is important to know the homologous genes from different species in order to determine the function and evolution of this gene. Furthermore, studying more about the biochemical and molecular properties of the glycoprotein will enable to better understand its role in the aqueous sticky coat as well as make a contribution in the general effort of developing the novel bio-based glue.

**Ascertaining Selenium Content in Soil from Beck's Bridge Mineral Licks**

Battuya Bayarmagnai with Dr. Stephen Williams  
Renewable Resources  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Ullanbaatar, Mongolia*

Whiskey Mountain bighorn sheep herd was one of the largest in North America. In the last couple of decades the population of this herd has been cut in half. After intense observations and research, one hypothesis for the reason of the die-off has been proposed: the selenium deficiency in diet might be the cause of the severe muscular dystrophy observed especially in lambs which enables them to escape from the predators.

The ewes were observed to travel from their summer range on Middle Mountain (Wind River Range) to an area called Beck's Bridge mineral licks and ingest soil after which they would go back to their lambs and nurse. The lambs recovered quickly.

In this particular study, we hypothesized that the soil from Beck's Bridge mineral licks would possibly contain more selenium than the soil on the Middle Mountain. Twenty seven soil samples have been collected from the mineral lick area where the bighorn sheep have been observed to eat soil. The soil samples were tested for their content of selenium, nitrates, phosphates and other elements. This study will contribute to the larger project of testing the hypothesis of the connection between available selenium and lamb survival.

**Burning Fat While Gaining Muscle:  
Exploring and Testing the Bodybuilder's Paradox**

Jacob Beck with Dr. Michael Liebman  
Family and Consumer Sciences  
University of Wyoming  
Oral Presentation

*UW Honors Program*

*Rozet, WY*

In the sport of bodybuilding, every athlete is concerned with the manipulation of two tissues: muscle and fat. Training regimens are designed in a broad sense to gain or lose weight. Specifically there are two cycles that are employed: bulking; the addition of both lean and fatty tissue achieved through training and a caloric surplus, and cutting; the loss of excess fat and preservation of lean tissue achieved through training and a caloric deficit.

With the exception of beginning athletes, it is thought to be difficult, if not nearly impossible, to gain lean tissue and lose fat at the same time. The paradox is found in the diet required for each goal: to gain weight (in this case a blend of muscle and fat) one must consume more calories than one expends; to lose weight (mostly fat and muscle to a smaller degree) caloric expenditure must exceed intake.

This research will present the results of a self-administered study designed to explore the possibility of gaining lean tissue while losing body fat; in addition, a review of pertinent literature on the subject will be discussed.

**Online Information System for Laramie Valley Chapel (LVC)**

Josh Becker and Michael Shirley with Dr. Van Baalen  
Computer Science Department  
University of Wyoming  
Oral Presentation

*UW Computer Science Senior Design*

*Laramie, WY*

Last fall Michael Shirley and Josh Becker began a project with Laramie Valley Chapel - a local church - to create an online information system. This system is being developed on the DotNetNuke web framework to be user-friendly and maintainable by non-technical users. It will have functionality such as an audio file repository, photo gallery, blogs, and will interact on a multilevel user environment.

**Prototype Paintball Turret**  
Carl Bernet, Barry Blaha, James Harlan, Thomas Kirkwood  
with Dr. David Walrath  
Mechanical Engineering  
University of Wyoming  
Oral Presentation

*Mechanical Engineering Senior Design*

*Katy, TX*  
*Sheridan, WY*  
*Kaycee, WY*  
*Casper, WY*

An actuating device was designed and constructed for use with an existing model paintball marker. Requirements for the design include portability, response time, size and durability.

The prototype allows the operator to actuate and fire a paintball marker remotely via wireless a radio frequency signal. Two step motors provide both the azimuth and vertical actuation of the paintball marker. Two microcontrollers control the step motors, with input from a third remote microcontroller. Feedback to the operator is given in the form of video. The device is capable of full continuous azimuth rotation due to the unique positioning of the tank supplying gas to the marker and an electric rotary couple.

This presentation will elaborate on several aspects of the design process and the current prototype. Possible improvements to the design will also be discussed.

**Causal Social Factors of High Risk Sexual Behavior in Adolescence and Adulthood**

Brianna Best, Sara Primus, Abbey George, and Anthony Roberts  
with Dr. Gary Hampe  
Sociology  
University of Wyoming  
Oral Presentation

*Sociology Department*

*Laramie, WY*

The research will address the causes of high risk sexual behavior using data collected from NHSLS and other previous research. Under consideration is whether groups who are in specific social settings are more or less likely to engage in high risk sexual behaviors such as young age at first intercourse and high numbers of sexual partners. The concept we want to explore is that differences in social background lead to variations in social bonds, which affects the likelihood of individuals to participate in high risk or non-conforming behaviors.

With nearly 40 million people worldwide infected with AIDS, the continually decreasing age of first intercourse, and the continually growing number of youth with STDS, causes of high risk sexual behavior are becoming increasingly critical to understand.

Much of previous research has attempted to understand the participation in high risk sexual behavior from an individual rational choice standpoint. This paper will attempt to demonstrate that social variables have a vital affect on the participation in high risk sexual behaviors.

**Motivation vs. Cognition: Examining the Processes Used in Worldview Defense**

Jamin Blatter with Dr. Michael Johns and David Webber

Department of Psychology  
University of Wyoming  
Poster Presentation*McNair Scholars Program**Rock Springs, WY*

The study will evaluate the hypothesis that cultural worldview (CWV) defense is enacted through motivational rather than cognitive processes. Eighty undergraduate students will be subliminally primed with either death or a neutral prime, and complete a CWV defense measure immediately after priming or after a five minute delay. Results are anticipated to demonstrate that CWV defense will be present in both the immediate and delay conditions when mortality is salient. Furthermore, it is expected that levels of CWV defense will be higher in the delay condition. These findings would suggest a motivational process and may be effective in evaluating one of the key components of Terror Management Theory by examining the methods individuals implement to assuage concerns about mortality.

**Bacteriophage-mediated Biocontrol of *Escherichia coli* O157:H7 in Soil**

Kyle E. Bolenbaugh with John D. Willford

Animal Science  
University of Wyoming  
Oral Presentation*Advanced Problems Course**Laramie, WY*

*Escherichia coli* O157:H7 continues to be a major foodborne pathogen. Recent outbreaks have occurred in ready to eat (RTE) fruits and vegetables that have been attributed to the presence of *E. coli* O157:H7 in soil. These recent outbreaks have perpetuated a need for increased control measures against pathogenic bacteria in soil. Bacteriophages, viruses which only infect bacteria, provide a safe, natural option of biocontrol against these pathogens. A cocktail of six bacteriophages specific against *E. coli* O157:H7 was developed and tested as a practical means for reducing this bacterium in soil.

Broth tests using a multiplicity of infection (MOI) of 100 showed the complete elimination of an *E. coli* O157:H7 culture with a  $10^5$  CFU/ml concentration within an hour with no evidence of resistance. Soil samples were inoculated with  $10^6$  CFU/mL in water and kept moist until cell counts stabilized. The bacteriophage cocktail was utilized to treat the soil at a MOI of 25. No significant reduction in *E. coli* O157:H7 was observed in the soil. The complex makeup of the soil likely retards the spread of bacteriophage and renders the control measure less effective. However, the efficacy in broth shows the great potential of bacteriophage as a biocontrol and certainly supports the need for further exploration.

## **From Barren to Beautiful: An Interior Transformation**

Allison Boomgaarden – Dr. Bruce Cameron  
Family and Consumer Sciences  
University of Wyoming  
Oral Presentation

*UW Honors Program*

*Burns, WY*

Interior Design involves creativity, knowledge of design and architecture, interpersonal skills, and the desire to create something beautiful. It is also important to please the client and create a space that they are comfortable in and love. This home theater was an opportunity to take a barren room in the basement of a Cheyenne, Wyoming residence and transform it into a warm and comfortable theater space that the clients will adore. With the use of neutral tones, splashes of color, dark leathers, warm lighting, and a few “theatrical” touches, this space truly transformed to become not only an attractive space, but one that the clients thoroughly enjoy. Project planning, materials selection, budgets, customer desires, project installment, and client satisfaction must all be in place to consider a design successful. Albert Hadley, one of the greatest designers of all time, said, “The essence of interior design will always be about people and how they live. It is about the realities of what makes for an attractive, civilized, meaningful environment, not about fashion or what's in or what's out. This is not an easy job.” His words are what keep the interior design industry a passion in my life.

## **Antibiotic Production in Wyoming Soil Actinomycetes**

Lady C. Botchway and Holly Jennings with Dr. Ami N. Erickson  
Division of Natural Sciences  
Sheridan College-NWCCD  
Poster Presentation

*INBRE*

*Sheridan, WY*

The purpose of the experiment was to identify actinomycetes collected from soil and to determine their effectiveness in producing antibiotic compounds against *Escherichia coli*, *Staphylococcus epidermidis*, and *Bacillus subtilis*. Actinomycetes in soil samples from Bud Love Wildlife Reserve outside of Buffalo, Wyoming were isolated and cultured on one side of half strength Standard Methods agar plates and allowed to grow at 37° C for seven days. *E. coli*, *S. epidermidis*, and *B. subtilis* were streaked perpendicular to the actinomycetes cultures and allowed to grow at 37° C for seven days. The plates were analyzed by measuring zones of inhibition due to antibiotic activity. Morphology of unknown *Streptomyces* samples producing antibiotics was examined. DNA of the samples was isolated, cloned by PCR, and compared.

## **Phi Factorization**

Tyler Branyan and Andrew Kreeger with Dr. Siguna Muller

Mathematics

University of Wyoming

Oral Presentation

*Wyoming School of Cryptography*

*Cushing, OK  
Wheatland, WY*

The research to be presented covers the development of efficient algorithms to determine Euler's Phi function for an integer with a known number of factors. Though it is not known if there is a deterministic function for the Phi value, finding a tight range estimate would have significant applications in cryptography.

Specifically, the Phi value of a number with two factors allows for discovery of those two primes. This is crucial because the RSA cryptosystem uses integers which are a product of two large prime numbers. Factorization of this large integer leads to the break down of the cryptosystem. Therefore, this research will focus primarily on estimating the Phi values of composite integers with only two factors.

## **Does habitual physical activity result in improved blood flow independent of body composition?**

Kevin Bretting with Dr. Derek T. Smith

Kinesiology and Health Promotion

University of Wyoming

Oral Presentation

*NSF EPSCoR*

*Loveland, CO*

Cardiovascular disease (CVD) is the leading cause of death in the United States. Obesity is a major risk factor contributing to CVD and elicits a negative effect on endothelial function. Participants of this EPSCoR study were recruited and categorized into one of four groups: 1) Lean Active (LA); 2) Lean Sedentary (LS); 3) Overweight Active (OA); and 4) Overweight Sedentary (OS). Baseline blood flow (BBF) and reactive blood flow (RBF), stimulated by a 4-minute occlusion of the brachial artery, were measured using venous occlusion strain-gauge plethysmography – a measure of endothelial function. The specific aim was to determine the effects of habitual physical activity (PA) and body composition on BFF and RBF.

BBF was similar between all four groups. The LA group showed significantly greater absolute and relative RBF values when compared to both sedentary groups ( $p=0.001$ ). The OA and LS groups demonstrated similar RBF values. Regression analysis revealed a significant negative relationship between percent body fat and RBF. When co-varying for percent body fat, the greater RBF in the LA group was maintained. These findings suggest that PA has a more powerful effect on stimulated forearm blood flow than body composition and may provide some cardioprotection in overweight adults.

**The Impact of Self-Construal Priming and Social Network Homogeneity On Attitude Stability  
and Change**

John Brooks with Dr. Michael Johns, Jerry Cullum, and Nicholas Schwab  
Psychology  
University of Wyoming  
Poster Presentation

*McNair Scholars Program*

*Laramie, WY*

Close friends and family members seldom all agree on important issues. The extent to which attitudes within these close social networks are heterogeneous can determine an individual's attitude stability over time. For instance, social network heterogeneity results in greater attitude change in response to a persuasive message (Visser & Mirable, 2004). The process through which social networks impact attitudes and attitude stability, however, remains unclear. The proposed study will investigate the role of self-concept (independent vs. interdependent) in modifying this relationship. Because interdependent self-construals increase attention to social and contextual information, we predict that priming interdependent self-construals will increase attitude change as a function of social network heterogeneity. College students will fill out a survey measuring their attitudes as well as their perception of the attitudes of five close friends/family members followed by either an independent or interdependent self-construal prime. Lastly, participants' attitude change and stability will be measured in response to a persuasive message about an issue. By manipulating participants' self-construals, this research will contribute to our understanding of how close social sources of information inform and shape individual attitudes.

**Protest: A Requisite for Democracy and a  
Verdict on Modern Activism**

Frank Brown with Dr. Teena Gabrielson  
Arts and Sciences  
University of Wyoming  
Oral Presentation

*UW Honors Program*

*Raleigh, NC*

At the moment America continues to grapple with issues and problems that government representatives have been charged to comprehend and resolve. There is a lingering war in Iraq, which by the government's own account has not met its anticipated end. Fundamental civil liberties have been reinterpreted under new standards of the government's national security posture. Some people sense that society's issues and grievances are being understated because constitutional safeguards on the powers of government are being taken for granted. They cite the absence of an identifiable and organized social movement which makes any effective headway into the government policy making system as evidence that the First Amendment right is not being utilized as is constitutionally necessary. Picket signs, strikes, boycotts, marches and popular protest songs were once a common backdrop to American society, and their absence leads some to determine that these times must be marred with political apathy. Before declaring that the citizen spirit to petition and reform government is exhausted, a rudimentary understanding of the American constitutional design and an examination of modern activism is obligatory. This essay analyzes the importance of protest in democratic governance and reaches a verdict on the effectiveness of modern activism.

## **Implementation of GIS at the Rocky Mountain Oilfield Testing Center**

Jeanette Buelt with Mentor, Jeffery Sun  
Geographic Information Systems  
Casper College  
Casper, Wyoming  
Oral and Poster Presentations

*Casper, WY*

Issue to be addressed is best method for converting field mapping system from drafting software to a Geographic Information System at the Rocky Mountain Oilfield Testing Center (RMOTC).

RMOTC operates the Teapot Dome Oilfield near Casper, Wyoming, also known as Naval Petroleum Reserve No. 3. During the past three years, RMOTC has been gathering and consolidating over 80 years of oilfield data and entering that information into a modern geo-computing environment and relational database. A major part of this process includes implementation of a true Geographic Information System (GIS). Over the past 2½ years, RMOTC has upgraded its GIS capabilities to display facilities, pipelines, well locations, roads, utility lines, remote sensing data, and other features in real world spatial coordinates. This is a major upgrade over past practices of using drafting software with stand-alone coordinate systems, not spatially referenced, for creating maps of the field and facilities. The GIS has allowed RMOTC personnel to display and integrate a large variety of spatial data in ways that were not possible before. RMOTC uses the GIS to store and display information used in a variety of oilfield applications such as creating basemaps of field infrastructure and facilities, displaying well production data, incorporating geological and geophysical interpretation, pipeline leak assessment and flow assurance, environmental monitoring, tracking oilfield operations, etc.

The data and maps generated by the GIS have been greatly appreciated by RMOTC scientists and engineers as well as RMOTC project partners. Implementation of the GIS has helped RMOTC to become the premier oilfield testing and demonstration center in the United States.

## **Adaptive Traffic Control on an Intersection**

Joe Buss, Chris Eyre, and Jerry Moore with Dr. Stanislaw Legowski  
Department of Electrical and Computer Engineering  
University of Wyoming  
Oral Presentation

*ECE Senior Design*

*Laramie, WY*

The project addressed was the creation of an intersection that adapts to traffic flow and provides a progress indicator for the traffic lights. The adaptive intersection was designed to be more efficient than a fixed time intersection by giving priority to the road with the most traffic. The progress indicator helps motorists to anticipate the light changes.

To implement adaptive timing, the number of cars going through the intersection is counted by the controller and the light timings are adjusted according to the number of cars travelling in each direction. A small scale model was used to demonstrate proper operation of the intersection. Red, green, and yellow LEDs were used to represent red, green, and yellow traffic lamps. Seven-segment LEDs were used to display the countdown of seconds until the next light change. The scaled model simulated an overhead view of the intersection and allowed for easy interpretation of results.

## **Does drug treatment in jail settings assist in reducing recidivism rates in drug abusers?**

Linus Callahan, Sarah Jacobs, Kara Sutton, Ashley Wing

with Dr. Gary Hampe

The Department of Sociology

University of Wyoming

Poster Presentation

*Sociology Department*

*Laramie, WY*

The research to be addressed is the efficacy of adult drug treatment programs within jail settings in reducing recidivism rates amongst non-violent drug-using offenders. The United States spends in excess of \$19 billion a year fighting drug abuse and little seemed to work in reducing drug use and drug crimes, until the implementation of drug treatment programs. Drug treatment programs are growing rapidly each year, and research on these programs indicates a reduction in recidivism. The dependent variable we are researching is drug treatment programs and the effect they have on recidivism rates. The independent variables are how social factors can influence the outcome along with completing the treatment program.

Based on this research we expect that gender, age, race, employment, and education levels will influence recidivism. Previous research has indicated that young, male, minority individuals with less education will be more likely than other participants in drug treatment programs to recidivate, thus those factors will be our independent variables. Data used comes from the Inter-University Consortium for Political and Social Research: Number 6628, *Drug Offender Treatment in Local Corrections in California and New York 1991 - 1993*. Preliminary research indicates that the drug treatment programs can reduce the cost of governmental drug prevention efforts.

## **Two Rural Main Streets: An Analysis from Environmental Psychology and Urban Design**

Mira Calton with Mary Humstone, M.S.

Psychology

University of Wyoming

Oral Presentation

*UW Honors Program*

*Rawlins, WY*

Main Street programs are used throughout the United States to economically develop and historically preserve downtown areas. The purpose of this paper is to discuss Main Street techniques based on studies conducted in the field of environmental psychology and urban design, and to specifically analyze the Laramie and Rawlins Main Street programs.

Environmental psychology is the study of how people are affected by the environments where they live, work, and play. Studies have been done from large-scale environments such as climate to the small-scale environments such as white noise at work. Researchers, in both psychology and urban planning, have also been interested in how to create urban environments that promote well-being, community interaction, safety, and a well-liked location.

This paper first introduces the Main Street approach to downtown development. Next, it will discuss environmental psychology and its applications to downtown areas in: peoples' preferences for their surroundings, processes used for wayfinding, methods to create a sense of place and life in a community, and the beneficial influence of nature. Lastly, Laramie and Rawlins Main Street programs will be analyzed and recommendations for improvement will be discussed.

## **Electronic Residential Door Locking System**

Emily Cantrell, Travis Lairscey, and Heather Lucero with Dr. Stanislaw Legowski  
Electrical and Computer Engineering  
University of Wyoming  
Oral Presentation

Volpi Cupal ECE Senior Design Fund

Cheyenne, WY

The project is a door locking system prototype with three methods of unlocking the entry door to a home: a remote control, a six digit keypad code, and a conventional key. This prototype includes a variety of features designed to add simplicity, security, and convenience. It enables individual remotes and keypad codes to be programmed with different entry privileges. This could allow for service people to enter the home only at permitted times, even if no one is there to let them in.

The system also includes a user friendly control panel to configure entry privileges for different remotes and keypad codes, a battery backup so that the system can operate during temporary power loss, and a lockout feature to disable keypad entry for one hour after five invalid attempts have been made. This system also enables people with limited dexterity to unlock the door from the inside of the home with a push button and uses a security mechanism to ensure the door shuts tightly after it has been opened.

## **Cancer Targeting Platinacyclobutane Prodrugs of the Anti-Cancer Drug Cisplatin**

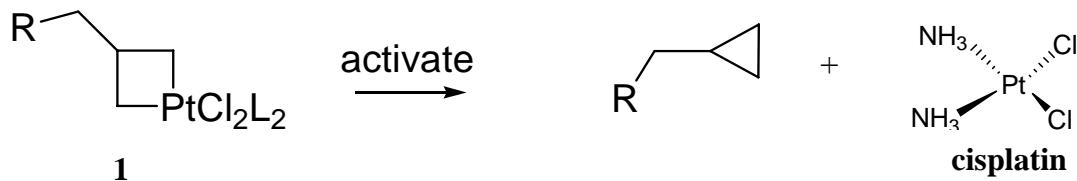
Whitney Chandler with Dr. John Hoberg  
Department of Chemistry  
University of Wyoming  
Poster & Oral Presentation

NSF EPSCoR

Cheyenne, WY

Cisplatin (Pt(II)) is a common therapeutic agent used in 50% of cancer therapies, however a disadvantage of this drug is its non-targeting nature, which results in destruction of any cellular DNA, not just in cancerous cells. We recently published<sup>1</sup> the synthesis of cisplatin prodrugs in the form platinacylcobutanes (**1**), where R is a cancer directing moiety attached to the cisplatin ring structure.

This poster will present our work on the synthesis of a platinacylcobutane that incorporates both the targeting group and an activator, allowing for transformation of the Pt(IV) complex to the active Pt(II) cisplatin complex.



**Is Your Best Friends Forever Bracelet or Anklet Killing You? A Longitudinal Study of  
Bacterial Numbers and Possible Pathogens on Woven Hemp Bracelets and Anklets**

Jianwei Chang with Anne Wolff  
Life Sciences Department  
Laramie County Community College  
Oral and Poster Presentation

*INBRE Program*

*Laramie County Community College*

*Fushun, China*

The purpose of this experiment was an analysis of bacterial numbers and possible pathogens found on woven hemp bracelets and anklets. As I know, many young people give bracelets and anklets to their best friends and they promise to wear them forever or at least until they deteriorate and fall off. When this happens a wish will come true. These bracelets and anklets are continuously worn during bathing, during the day, and at night. I wondered how many bacteria, non-pathogens and pathogens, might be found on these bracelets and anklets.

In my project I made a bracelet and anklet out of woven hemp and work them for one, two and three weeks. I soaked the bracelet and anklet in sterile water, and plated out dilutions of 1:100, 1:10,000, and 1:1,000,000 onto Trypticase Soy Agar, Mannitol Salt Agar, and MacConkey's Agar. After incubation, I counted the number of colonies and multiplied by the dilution factor. As time progressed, I found the total number of bacteria and possible pathogens, increased in the bracelet and anklet. This could possibly pose a health risk for the wearer.

**Comparison of grazing effects on periphyton between native and invasive species**

Caroline Charles with Dr. Amy Krist  
Department of Zoology and Physiology  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Durango, CO*

Non-native species that become invasive can significantly alter the environment. For example, a recent study showed that *Potamopyrgus antipodarum*, a freshwater snail from New Zealand, consumed 75% of gross primary productivity in a stream in the Greater Yellowstone Ecosystem. Such a high rate of consumption suggests that *P. antipodarum* are likely to have significant ecological and evolutionary effects on native grazers. To determine the extent of dietary overlap between *P. antipodarum* and native grazers, we examined periphyton that remained after two weeks of grazing by the invasive snail and three native species; the mayfly *Ephemerella* and caddisfly *Glossosoma* that primarily graze periphyton, and the caddisfly *Brachycentrus*, which is a facultative grazer. After *Glossosoma* were omitted from the analyses because of mass mortality, we found that only the invaders and mayflies significantly reduced chlorophyll *a* and ash free dry mass relative to ungrazed controls. The invasive snail also had the largest effect on the community of diatoms. Relative abundance of diatoms were similar among grazers suggesting that significant overlap exists in the diets of the invasive and native grazers. These results suggest that the invasive snail is likely competing with native grazers for food resources.

## **Synthesis of Degradable Thermoresponsive Micelles (DPEGs)**

Yi Ern Cheah with Dr. Youqing Shen  
Chemical and Petroleum Engineering  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Kuala Lumpur, Malaysia*

Thermoresponsive micelles have been surfacing as one of the many potential pioneers in advanced drug delivery especially in the biomedical field. Research to be addressed is the synthesis of a new type degradable thermoresponsive polymer known as Degradable PolyEthylene Glycol analogs (DPEGs). These micelles are very well suited for targeted drug and gene delivery to cancer cells as they are thermoresponsive, degradable, and non-toxic.

DPEGs could possibly be the next step in combating cancer as it can be made into specialized fast release drugs that would attack cancer cells before they develop any antidrug resistance. One of the advantages of its thermoresponsive property is that its temperature could be used as a trigger for drug loading or release. Being degradable is also very useful as these micelles can degrade into small molecules and be safely discharged from the body. Its non-toxic property is an added advantage as it enables the micelles to cause minimum harm when introduced into the human body.

## **H.V.A.C. for I.D.E.S. Server Room**

Shiri Choresh and Kevin Ritter with Cenk Yavuzturk  
Mechanical Engineers, Architectural Engineer  
University of Wyoming  
Oral and Poster Presentations

*NSF EPSCoR*

*Laramie, WY*

IDES – the Plastic Web intends to move their server room and expand from a two to a five server rack capacity. The server racks were calculated to each contribute 20,000 - 25,000 Btu/ hr with a potential when full to produce 30,000 Btu/ hr of heat generation in the current server room.

The Air conditioners currently being used are rated for a combined cooling capacity of 48,000 Btu/ hr. As such they will not be effective when IDES projected growth to three full server racks generates a cooling load of 95,000 Btu/ hr, nor will they be able to handle the 150,000 Btu/ hr generated by five server racks.

The recommendation is to use outside air for cooling the server room. It can be conducted with the combination of cooling coil, humidifier, and by installing a programmable logic controller to allow for ventilation without a/c when the outdoor temperature is less than indoor. A "Smart unit" which combines together the applications of cooling coil and humidifier is not available. However, IDES can use three InteleCool®2 units model ET048A with economizers, produced by Liebert as a cooling coil and Humimax HM2 unit, manufactured by Munters, as a humidifier.

**Parental influence on youth physical activity:  
Comparison using subjective and objective measures of activity**  
Karen Elizabeth Cody, Brandon Alderman, Ph.D., and Tami Benham-Deal, P.E.D.  
Division of Kinesiology and Health  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Fort Collins, CO*

The role of the family in shaping children's physical activity behaviors has been identified as an important research agenda. However, the exact nature of parental influence on youth physical activity remains elusive. Therefore, the purpose of this study was to examine the direct and indirect influence parents have on children's physical activity. Specifically, the relationship between parents' and children's objectively measured physical activity, time spent in physical activity together, and the importance/enjoyment of physical activity were compared. 98 children (11.9 years; 48 females) and their parents (97 mothers, 43.2 yrs; 60 fathers, 43.9 yrs) completed a series of questionnaires and wore a Digi-Walker pedometer for at least four consecutive days. Results revealed that mothers recorded the lowest physical activity per day ( $M_{steps} = 8947$ ), followed by fathers ( $M_{steps} = 9318$ ) and children ( $M_{steps} = 10,492$ ). Mothers were more accurate in their assessment of children's physical activity although the amount of time families engaged in physical activity together was less than 2 days/week ( $M = 1.51$ ). Parental beliefs played a relatively small role in their children's physical activity and increasing the amount of time families spend exercising together may be an effective strategy to increase both adult and youth physical activity.

**Postpartum Depression Animal Model Development**  
Stephanie Cohn with Dr. Gail Leedy  
Social Work  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Golden, CO*

The issue of postpartum depression and its effects on both the mother and offspring will be investigated using an animal model. Two models for social stress will be tested using rats. Chronic social stress encountered while living in semi-crowded conditions, with both males and females is believed to result in depressive behaviors in the mothers which ultimately has the possibility of affecting the offspring.

Postpartum depression is a prevalent serious complication of pregnancy in people which results in negative implications for both the mother and the infant. Given the potential serious consequences of postpartum depression, it is imperative that a better understanding of the disorder be reached in order to improve the lives of both mothers and their infants.

Researchers in the past have developed animal models which utilized several methods to induce noticeable stress in rats. Decreased maternal behavior and depression like behavior has been seen with long separations of mother rats with their pups. This research will attempt to determine a social stressor protocol within a rat model to further the future research on postpartum depression.

### **Ammonia From Coal**

Diane Cone, J.R. Maxfield, Derek Schreinert, Christina Skinner, and Tigist Tafesse with  
Dr. H. Gordon Harris  
Chemical Engineering  
University of Wyoming  
Oral Presentation

#### *Chemical Engineering*

Ammonia synthesis plants traditionally use a natural gas feedstock as a source of hydrogen. Due to the low and stable cost of coal, it is desirable to use coal as a feedstock and primary source of hydrogen. In this project, a case study is conducted for Dyno Nobel in Cheyenne, Wyoming, which utilizes coal as a feedstock. An ammonia synthesis plant is developed, by utilizing a coal gasifier, reactors to maximize the hydrogen yield, and an ammonia synthesis reactor. Hydrogen for the ammonia synthesis comes from the gasifier and the nitrogen comes from air

### **Synthetic Spider Silk: an Emerging Biomaterial**

Alyssa R. Cooper with Dr. Randy Lewis  
Department of Molecular Biology  
University of Wyoming  
Oral Presentation

#### *NASA Space Grant Consortium*

*Laramie, WY*

Major ampullate (dragline) and flagelliform spider silks are noted for their incredible strength and elasticity, respectively. Previously conducted research has identified the amino acid sequences thought to be responsible for these characteristics in natural spider silk. A linker-polyalanine motif has been found to confer strength to dragline silk whereas a highly repeated GPGGX motif is thought to give elasticity to flagelliform silk. This work focused on the strength/elasticity relationships seen in a series of genetically engineered proteins designed to express varying ratios of these motifs. Our goal was to determine the effects the protein sequence has on the conditions needed for spinning and the effect of both of sequence and spinning conditions on the properties of resulting fibers.

A brief outline of the project is as follows: three clones of genetically engineered bacteria have been successfully cultured and induced to express the ‘Y series’ of recombinant silk-like proteins, the protein was obtained from the bacterial cells via cell lysis and purified using affinity chromatography. The purified protein was then lyophilized and used for spinning experiments.

## **Automated Pill Cutter / Dispenser**

Erica Weber and Alyssa Cooper with Dr. Stanislaw Legowski and Dr. David Whitman

Department of Electrical and Computer Engineering

University of Wyoming

Oral and Poster Presentation

*Rehabilitation Engineering Research Center on Accessible Medical Instrumentation*

*& University of Wyoming ECE*

*Laramie, WY*

For people with severe arthritis or a disability that limits dexterity, accessing daily medications can be a painful, tedious task. If the pills of any medications are to be cut in half, this becomes a virtually impossible task. In an effort to help increase the independence of such clients, we designed a prescription bottle cap that automatically cuts and/or dispenses a prescribed dosage at a given dosage interval as set by the pharmacist.

Our battery-powered device automatically dispenses a half, one, or two-pill dosage at the time interval that is programmed into the device through an LCD screen/keypad user interface. The prototype cuts and/or dispenses a single size and shape of pill and reminds users to take medications with both audible and visual alarms. It also provides multi-modal indicators of device status displayed to user during the dispensing/cutting process and continually displays recorded information on how many dosages have been dispensed.

## **The Six Methods of Vocal Pedagogy and their Application**

Meghan Dawson with Dr. Katrina Zook

Music

University of Wyoming

Oral Presentation

*UW Music Department*

*Lander, WY*

The topic to be addressed is the six methods of vocal pedagogy as outlined by the pedagogue William Vennard. They are: inspirational pedagogy, mechanistic pedagogy, phonetic pedagogy, demonstrative pedagogy, poetic pedagogy, and progressive pedagogy. Each method has its strengths and limitations, and these points will be examined.

Furthermore, different methods are more effective on individuals depending on the specific learning style of the individual. Therefore, while some teachers of voice may claim preference to one method, the reality is that a combination of several methods may produce more effective results in students. Thus, a thorough knowledge of all six methods allows teachers to draw from a diverse repertoire of methodologies in order to adapt lessons for each student. This project will attempt to match specific pedagogies to specific types of learners, as well as demonstrate how these are applied in a lesson.

## Brewing: A Green Process - Brew Crew

Mat Dolezal, Kent Miller, Nick Stuckert, and Sean Ukele, with Dr. H Gordon Harris  
Chemical Engineering  
University of Wyoming  
Oral Presentation

### *Chemical Engineering*

This project evaluates the economic feasibility of “green” brewing. “Green” brewing refers not only to minimization of wastes, carbon dioxide expiration and necessary utilities, but also includes a detailed investigation of alternate and renewable energy sources that may be integrated into the process.

## NK3 Receptors in the Paraventricular Nucleus of Rats

Kevin Dunbar with Mr. Dane Jensen  
Neuroscience: Department of Zoology & Physiology  
University of Wyoming  
Oral Presentation

*NSF EPSCoR WySTEP*

*Meeker, CO*

The research conducted centers on brain neuropeptides called tachykinins that play a major role in regulating salt intake. This research focused even further on the tachykinin, neurokinin 3 receptor (NK3R), which is a G-protein coupled receptor located in the paraventricular nucleus (PVN) of the hypothalamic region of the brain.

The nuclear transport of NK3R was examined in male Charles River rats that were given no treatment or an intragastric load of 2 M NaCl. The rats displaying no treatment were sacrificed after 40 minutes, those given the intragastric load of NaCl were sacrificed immediately. After sacrificing, the brains were removed, the PVN was blocked and the nuclei were fixed using a solution of Para formaldehyde and Gluteraldehyde in PBS. Sections of the brains were cut using an ultra microtome and placed on formvar coated copper grids. Different samples of brain sections were incubated with two different antibodies against different sequences of the NK3R and then a second antibody labeled with gold beads.

A small amount of gold beads were present in rats sacrificed immediately, but the density of NK3R gold beads within the nucleus increased 12 fold in the rats that were given the intragastric load of NaCl and sacrificed after 40 minutes. This large increase in NK3R may suggest that NK3R is directly regulated by the genome and affects how PVN neurons respond to osmotic challenges.

**Comprehensive Environmental Assessment Addressing Issues of Social and Economic Dimensions for Preservation, Conservation, and Development Management Plans Relating to Road Expansion in Forested and De-forested Areas between Panama City and Colon, Panama**

Clayton Elliott with Dr. Roger Coupal

Economics and Finance

University of Wyoming

Oral Presentation

*UW Honor Program*

*Powell, WY*

The government of Panama has proposed the construction of two new 4-lane highways that will connect the cities of Colon and Panama City. An unsophisticated two lane road currently exists in the area; however, the plans call for the widening and straightening of that road and the construction of a new toll road. Any development in these fragile ecosystems will have potentially drastic impacts for the natural water cycle that facilitates the operation of the nearby Panama Canal. Additionally, any development in the region will drive changes to the social structure and economy of Panama. The proposed assessment will address those concerns.

The environmental assessment will approach the analysis through three distinct lenses. First, the full expansion of the proposed roads across the interior is explored. Second, the analysis will examine a limited expansion with reforestation offset mechanisms. Finally, the no development option will be explored.

Primarily, the proposed socioeconomic assessment will investigate issues and inform discussion of economic development. For that purpose, economic development is concerned with the overall betterment of people's lives, not just per capita income growth. It includes a diversification in economic structure, a reduction of absolute poverty and inequality, sustainable use of all forms of capital, and the expansion of social opportunity.

**Human-Powered Transportation: The NASA Great Moonbuggy Race**

Brittany Fain, Jared Houfek, Andrew Robbins, and David Wenig

with Mr. Scott Morton and Dr. Nancy Peck

Mechanical Engineering

University of Wyoming

Oral and Poster Presentations

*Wyoming NASA Space Grant Consortium*

*Laramie, WY*

In 1994, the National Aeronautics and Space Administration (NASA) created the first Great Moonbuggy Race to commemorate the 25<sup>th</sup> anniversary of the Apollo lunar landing. The race was held at NASA's Marshall Space Flight Center in Huntsville, Alabama. The task facing the collegiate competitors was to design, construct, and race their human powered vehicles (HPV's) on a course simulating lunar terrain (craters, rocks, and fine, dusty soil). Nearly 14 years later, this competition has become an annual event. With the help of sponsors like Northrop Grumman Corporation, Jacobs, and Boeing, NASA is continuing to present this unique challenge to students around the world.

The task facing the University of Wyoming student design team was to design, fabricate, and test a vehicle worthy of participation in the annual NASA event. Using their engineering knowledge, as well as guidelines set forth by NASA, students undertook the design project. Throughout the duration of the project, designers played an active role in the entire design process. Additionally, the students tested their final product through participation in the Great Moonbuggy Race. This presentation will outline the aforementioned design process, discuss the vehicle's performance in the race, as well as suggest recommended design modifications.

**Keeping it Together:  
Stage Managing A *Chorus Line***

Danielle Fullerton with Dr. Larry W. Hazlett  
Theatre & Dance  
University of Wyoming  
Oral Presentation

*UW Honors Program*

*Helena, MT*

This semester I am working as Production Stage Manager for the Department of Theatre and Dance's production of *A Chorus Line*. This is the department's first musical in several years, and is under the direction of James B. Nicola, a theatre professional based out of New York City.

This job requires a great deal of time and organization on my part, as my job requires that I keep every aspect of the show running smoothly from pre-production, into rehearsals, the run of the show, and post-production. To do this I am in constant communication with all members of the production staff (designers, directors, etc.), as well as the performers in the production, keeping everyone informed of what is going on, what has been accomplished, and what has yet to happen. Once the show opens I am responsible for its maintenance and smooth running. Throughout the entire process I will be keeping track of everything in a veritable "bible" of the show, called a prompt book.

In my presentation I will discuss the processes I undertake to make a show run smoothly, my expectations for *A Chorus Line* in particular, surprises that popped up along the way, and how it all came together in the end.

**Exile in Anglo-Saxon Texts**

Heather L. Goss with Dr. Susan Aronstein  
and Dr. Carolyn Anderson  
English Department  
University of Wyoming  
Poster Presentation

*UW McNair Scholars*

*Logan, OH*

This research will examine one of the most common themes of Anglo-Saxon texts: exile. This theme appears, in some form, in texts as diverse as *The Wanderer*, *The Seafarer*, *The Wife's Lament*, *Beowulf*, and *The Battle of Maldon*. All of these works include an exile, someone who has been banished, possibly due to an unworthy act committed by that person, or some sort of shame cast upon that person. What are the similarities of exile within these texts and why is exile so prominent? What are the parameters to put a person in exile and do those parameters provide a way to socially behave? To pursue the answers to this study I will read these texts and their critical analyses. I will also read discussions of Anglo-Saxon history and culture. I will then do a comparative analysis of the literary texts in their historical and cultural context. Through this research, I seek to provide a greater understanding of Anglo-Saxon texts and culture and to better understand the formulaic composition of Anglo-Saxon poetry.

## The Intuitiveness of Moral Intuitions

Piper Taylor Grandjean with Dr. Karen Bartsch and Jennifer Wright  
Psychology  
University of Wyoming  
Oral Presentation

*UW Honors Program*

*Laramie, WY*

People tend to respond more critically to moral disagreements than to non-moral disagreements, and attitudes toward moral issues are held with greater strength than attitudes toward non-moral issues. It has been argued that this is because our morality is grounded in automated moral intuitions established by evolutionary processes. According to this hypothesis, we don't reason when encountering moral issues—our responses are emotive. If moral judgments are grounded in automatic processes, then moral judgments should be more accessible than non-moral judgments. Furthermore, the accessibility of a judgment on an issue should be related to the strength of the attitude toward that issue. This study employed reaction time methods to test this hypothesis.

Contrary to the moral intuitions hypothesis, participants did not generally classify issues as moral more quickly than non-moral (in fact, they classified issues as personal the most rapidly, though participants did have significantly more negative attitudes towards moral issues than non-moral issues. Moral attitudes were not more central or important to participants than non-moral attitudes, although they were more extreme. One reason for these findings might be that participants reported thinking about personal issues significantly more often than they thought about moral issues.

## Determination of Heart Cell Type and Subcellular Location of Arginase 2

Kevin Grauberger with Dr. Mark Stayton  
Molecular Biology  
University of Wyoming  
Poster Presentation

*NSF EPSCoR*

*Mitchell, NE*

Heart disease is a profound human health problem worldwide and has been the leading cause of death in the United States since 1990. Fifty-four percent of the heart disease problems are due to coronary heart disease. In 2003, about 3.5 % of the United States population, or 4.2 million men and 3 million women, suffered an acute myocardial infarction (American Heart Association, 2006). In an effort to understand the early responses in the heart to an acute myocardial infarction (AMI), a microarray study was performed and the arginine-nitric oxide-polyamine pathway was highly up-regulated (Harpster et al, 2006).

The goal of this project was to determine the cell type and subcellular location of arginase 2 (ARG2) an enzyme involved in the metabolism of L-arginine and up-regulated during a heart attack. Western blotting was used to confirm ARG2 showed an induction following AMI. In addition, immunohistochemistry was used to determine the cell type and intercellular location of ARG2. ARG2 is predicted by sequence analysis to localize to the mitochondria. Multiple experiments were done to label ARG2 via immunohistochemistry. The images showed moderate background and no clean signal. Although suitable for western blot analysis, this particular ARG2 antibody was not suitable for immunohistochemistry.

**Design of a CO<sub>2</sub> Sequestration Unit to Integrate with a Coal Fired Power Plant - C-Quest**

Jade Green, Savanna Sharp, Chris Schultz, and Ryan Taucher with Dr. H. Gordon Harris  
Chemical Engineering  
University of Wyoming  
Oral Presentation

*Chemical Engineering*

With current global warming projections, reducing CO<sub>2</sub> emissions is an issue of great importance. Two of the largest sources of CO<sub>2</sub> emission are automobiles and coal-fired power plants. Our project investigates a new methodology for reducing CO<sub>2</sub> emissions in coal-fired power plants. Our presentation includes an analysis of adsorption using carbonaceous sorbents and two different desorption processes. This project was conducted in conjunction with the Laramie River Station and Dave Johnston power plants.

**Ayaka no Monogatari:**  
**A Fiction about Ikebana and the Meiji Restoration**  
Carrie Groathouse with Dr. Janice Harris  
International Studies  
University of Wyoming  
Oral Presentation

*UW Honors Program*

*Laramie, WY*

This work is a researched fiction focusing on the Japanese art of flower arranging, Ikebana, and the rapid modernization and westernization of Japan at the beginning of the Meiji Era. Changes and consistencies in both Ikebana and Japanese society and culture are addressed as seen through the perspective of the main character. An underlying focus of this story is the Japanese cultural ethos and how it changed and developed with the introduction of a long absent foreign influence.

Within the story the art of Ikebana is explained in detail as seen through both Japanese and foreign perspective. This addresses how flowers are chosen and used and what the deeper meaning of Ikebana arrangements may be. Various schools and places of display for this art are explained and defined.

## **Balloon Satellite: Design and Development**

Robert Grogan and Jonathan Held with Dr. Stanislaw Legowski

Department of Electrical and Computer Engineering

University of Wyoming

Oral Presentation

*NASA Exploration Systems Mission Directorate*

*Aurora, CO and Laramie, WY*

The term “balloon satellite” refers to a lightweight package that is attached to a weather balloon. The balloon climbs to an altitude of 100,000 feet before it bursts, and the package descends back to Earth with a parachute. The development and launching of balloon satellites is lucrative because it provides a unique educational opportunity to promote space and science, and also because the packages can be used for lost plane exercises, where the uncontrolled landing position of the package is simulated as a lost plane. Unfortunately, these devices are prone to failure due to the package’s exposure to extreme cold in the upper atmospheres.

The specific design issues of a balloon satellite were identified, and solutions were pursued to maximize balloon satellite functionality and tolerance to cold. Multiple features were integrated together with a microcontroller, including Global Positioning System (GPS) tracking, communication with a ground station using amateur radio, and storage of all data into a commercial SD card. The design is then implemented into a prototype balloon satellite. This robust, well-insulated prototype was tested in conditions similar to what the balloon will face, with satisfactory results.

## **HIV and AIDS: Morality versus Mortality**

Carley Grubbs and Dr. Michelle Jarman

Wyoming Institute for Disabilities

University of Wyoming

*UW Honors Program*

*Cheyenne, WY*

This research discusses how the stigmatizing nature of sexually transmitted infections such as HIV and AIDS affects policy-making and treatment of people with the disease. In this paper I will offer evidence to support the assertion made by the Guttmacher Institute that social construction of attitudes and behaviors surrounding HIV have contributed to the understanding (or misunderstanding) of prevention and treatment of the virus. I will compare models of comprehensive sexual education programs, which effectively address the issues of safer sex and STI transmission and those that do not. I will also discuss the numerous reasons that these ineffective programs are in existence and sadly proliferate not only in the United States but also around the world, as well as studies that address the effect that these programs have had on HIV transmission and treatment of individuals infected by the virus.

## **Downhole Monitoring Device**

Nicholas Gurbhoo with Dr. Charles Dolan  
Electrical and Computer Engineering  
University of Wyoming  
Poster Presentation

*UW College of Engineering and Applied Sciences*

*Laramie, WY*

A completely autonomous wireless sender-receiver for position detection in the hollow drill shaft of a steel oil rig is presented. High pressure non-destructive testing methods are being carried out to analyze the behavior of the system under test and the ability to withstand high pressure flow while generating power effectively. As a result, a microprocessor controlled transducer will be powered by the high pressure generator in the hollow drill shaft. Upon activation, the transducer transmits an ultrasound-encoded signal to a receiver, in the form of a real-time digital signal processing system at the surface level.

Experiments have been carried out using a jointed steel pipe structure, 6 feet in length, 4 inches in diameter and 1 inch in thickness, completely immersed in water. The transmitter was attached to the inner wall of a spur pipe and configured to generate narrow bandwidth, low frequency ultrasonic signals, coupled to the pipe as an axisymmetric mode. Results confirmed that although some attenuation occurs, the signal processing system successfully identified the signals above the background noise. This paper will attempt to expose the strategy allowing this system to be realizable and effective.

## **Free Trade Problems, Fair Trade Solutions**

Anna Guyton with Dr. Terri Rittenburg  
International Studies  
University of Wyoming  
Oral Presentation

*UW Honors Program*

*Placerville, CA*

The market plays a very important and prevalent role in our society. Sadly, among the enormous economic prosperity of “First World” countries, many “Third World” countries continue to live in a state of dire poverty. Commerce will play a large part in holding these countries back through exploitation or giving them a foothold with which they can raise themselves out of poverty in the future.

This paper explores and discusses basic theory and logic behind the economics of free trade and classic capitalist thought. Empirical data reveal many instances, however, where free trade has not lived up to its theoretical standards. Economic pressures have led to shocking exploitation of both human and natural resources that is not sustainable. Eventually, exploitation at the global scale could lead to the downfall of capitalism, the First World, and humanity.

The Fair Trade Movement is a relatively recent development but has had surprising success in the world market. Rather than maximizing short-term profits at the expense of long-term sustainability, fair trade aims to support and sustain the resources that an industry and its producers depend on. In this way, fair trade can help eradicate dire poverty, counter environmental degradation, and promote global peace.

## **Water Reclamation in Developing States and the World Bank**

Nathaniel HadleyDike with Ronald Beiswenger

Department of Geography

University of Wyoming

Oral Presentation

*UW Honors Program*

*Broomfield, CO*

The first half of the 20<sup>th</sup> century was a period marked by rapid expansion of large scale water reclamation projects in the United States and Europe. This development set a course many less developed nations hoped to follow. Yet at the close of the 20<sup>th</sup> century and beginning of the 21<sup>st</sup> century the United States and other developed countries are seriously examining the value of their large scale reclamation projects. For countries seeking financing from international development agencies such as the World Bank this has meant having to examine a much broader range of factors to gain funding. Today countries planning a large scale water reclamation project and seeking financial support from the World Bank have to consider not only short term economic advantages but also environmental factors along with social justice issues, and long term viability. As a result the number of large scale water reclamation projects funded by the World Bank has declined over the past couple of decades.

### **Invasion of the periphyton snatchers?**

#### **A study of the impact of the New Zealand mud snail on a native snail in Yellowstone National Park**

Brenda K. Hansen with Dr. Amy Krist

Department of Zoology and Physiology

University of Wyoming

Poster Presentation

*McNair Scholars Program*

*Casper, WY*

Invasive species are being documented on a global scale. As a result, numerous studies have been conducted to assess the damage they cause, and to help determine possible changes. This experiment will examine how an invasive snail (*Potamopyrgus antipodarum*) and a native Yellowstone National Park snail (*Pyrgulopsis robusta*) respond to the amount of phosphorus (P) in their diets. The experiment will examine the response of invasive and native snails that compete directly for the food resource periphyton (micro-fauna growing in the benthic zone), to two levels of P in their diets, as well as to test the growth rate hypothesis in each species by comparing growth rate to percent P and percent RNA. The two P treatments will be established by manipulating the Nitrogen to Phosphorus ratio in the nonhomeostatic algae that is fed to the snails. Each P treatment will have two separate species treatments each with equal biomass. Snail growth rates will be measured bi-weekly and percent P and percent RNA will be measured during the rapid growth phase. This experiment allows us to determine whether *P. antipodarum*'s response to varying levels of phosphorus contributes to their invasiveness.

## **An Experimental Study of an Annular Jet with Zero Blockage Ratio**

James Harlan with Dr. Douglas Smtih  
Mechanical Engineering  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Kaycee, WY*

An annular jet with zero blockage ratio was created at the exit of a tube with a dielectric barrier-discharge plasma actuator. The plasma actuator creates an annular wall jet along the interior surface of the tube and just inside of the tube exit. At the exit of the tube, the wall jet becomes an annular free jet with no flow blockage interior to the annulus. Particle image velocimetry measurements were made in a plane bisecting the jet axis. The velocity fields reveal an annular jet that grows preferentially towards the axis of the jet. Streamtraces obtained from the mean velocity field reveal that the fluid interior to the jet is drawn along the jet axis and radially outward as the annular jet entrains fluid. Contours of the streamwise component of the velocity reveal a region of nearly stagnant fluid interior to the annular jet just upstream of the merging of the annular jet shear layers.

## **Preliminary Age Determination of Unconsolidated Deposits On Top of Table Mountain, Fremont County, Wyoming.**

Eric J. Harvey with Suzanne M. Smaglik  
Geology  
Central Wyoming College  
Poster Presentation

*NSF EPSCoR*

*Riverton, WY*

The age of sedimentary deposits on top of Table Mountain in Fremont County remains an enigma despite its prominence in the local landscape (2500 feet above the valley), and its location near some of the most studied geology in the country. While not the specific topic of any research or general papers in the immediate area, it is mentioned by several, and its age has been stated as being anywhere from Eocene to Pleistocene. Four samples from the southwest part of the mountain yielded Be-10 ages from 783 ka to 135 ka (Dahms, 2004).

Our main question is to determine the age of the surface and the associated deposits. A quantitative inventory of the large ( $> 1$  m high) boulders has been completed. The majority of boulders on top of Table Mountain are blocky, split, leucocratic granite with hard surfaces and lichen growth on the eastern faces. They are sitting within a matrix of lightly weathered grus and smaller rounded boulders. Based on these preliminary findings, we are confident that the boulders on the southern part of Table Mountain have the proper characteristics for 10-Be isotopic dating, and that future analysis will lead to a narrower age range.

## **NSAID inhibition of a kallikrein-like serine protease isolated from southern copperhead**

*(Agkistrodon contortrix contortrix) venom.*

Jami Harvey, Levi Van Buggen with Dr. Rob Milne

Natural Science Division

Sheridan College

Poster Presentation

*INBRE*

*Sheridan, WY*

Snake venom is a complex mixture comprised of enzymes that can immobilize and digest prey or be used as a defense mechanism. These venoms consist largely of enzymes which can act as toxins in biological systems. Certain venom components have enzymatic effects which result in lowered blood pressure, heart failure, and excessive damage to tissue and some neurological functions. Kallikrein-like enzymes are common in snakes such as vipers and rattlesnakes. Kallikrein-like activity may explain some of the cardiovascular responses that result from envenomation.

This investigation looks at the effect of commonly available non-steroidal anti-inflammatory drugs (NSAIDs) on the kallikrein-like activity of a serine protease found in the venom of *A. c. contortrix* (southern copperhead). Enzymatic assay data and background information proposing explanations of observed enzymatic activities will be presented.

## **A Look at Cryptology: Factorization and Creating a Model of Completely Secure Key Sharing**

Karl Heimbuck with Dr. Eric Moorhouse

Department of Mathematics

University of Wyoming

Oral Presentation

*NSF EPSCoR*

*Guernsey, WY*

In a rapidly growing world of technology, it is estimated that at least one billion people in the world have internet access. Large amounts of information are being exchanged every second, resulting in a high demand for the ability to transfer this information securely. These securities are built on the difficulty of factoring large numbers, often, numbers of hundreds of digits in length. This research project takes a look at one method of doing this, Pollard's  $p - 1$  factorization method. Additionally, the research created a simulation model of completely secure key exchange, another important aspect of exchanging information securely and secretly. Using the laws of quantum physics, quantum cryptography provides a method for this type of key exchange.

## **Convolutional Codes**

Karl Heimbuck with Dr. Sylvia Hobart  
Department of Mathematics  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Guernsey, WY*

Each minute millions of bits of information are traveling through the air. However, some of these bits can be received incorrectly because of outside static, resulting in incorrect information. To protect against this, information is often encoded with codes that can correct the errors that might occur. One such type of error-correcting system makes use of convolutional codes.

Convolutional codes are used in mobile phones, satellite links, and Bluetooth products. Thus, it is important that they are efficient as possible. This research will analyze convolutional codes and will look at turbo codes, a coding system that uses multiple convolutional codes.

## **Deoxyribonucleoside kinase: Sequencing from *Tribolium***

Dietric Hennings with Dr. David Liberles  
Molecular Biology  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Cheyenne, WY*

There are many reasons for my interest in the University of Washington School of Medicine past the WWAMI advantage. The University of Washington is known for its dedication to community service, an area of medicine I believe will become more essential. As insurance remains unattainable for some demographic groups, volunteer medicine, like that provided by the Downtown Clinic, is necessary. Hailing from Wyoming, I have an extraordinary interest in rural medicine and preventative education. Programs in these areas create a means of better healthcare for people who might not have access to adequate facilities. Teaching someone how to better care for them self is both attractive to my nurturing nature and allows for me to identify with their independence originating from their rural roots. The University of Washington is active in understanding the advantages and limitations of rural medicine while remaining sensitive to a community's need for care. My obligation to the state of Wyoming through a WWAMI contract is not an obligation at all, but my desire to live and serve in Wyoming regardless of my place of education. The University of Washington fits me in my desires as a physician and my dream to practice rural medicine.

## **Child Lift Wheelchair**

Justin Henshaw, Matthew Price, Earle Mock  
with Dr. David Walrath  
Mechanical Engineering  
University of Wyoming  
Oral and Poster Presentation

*Mechanical and Electrical & Computer  
Engineering Departments*

*Gillette, WY  
Julesburg, CO  
Sidney, NE*

Tyler, a 13 year old who has been disabled by shaken baby syndrome, has gone through life in the care of foster parents. He has the motor skills equivalent to that of a 3 month old child; in addition he is blind and deaf without verbal communication abilities. After hearing this story JEM Engineering founded by Justin Henshaw, Earle Mock, and Matthew Price, students in the Mechanical Engineering Department at the University of Wyoming, agreed to help his current foster parents by designing and manufacturing a wheelchair designed to his specific needs.

Design specifications, a chair that would lift Tyler from nearly ground level to a height of at least 32 inches, recline, include safety straps, be relatively light in weight, durable, and maintain most of the characteristic of a wheelchair as prescribed by the Americans with Disabilities Act, were developed in consultation with Tyler's foster mother. The wheelchair will primarily be used in the home and school with limited outdoor exposure. This wheelchair has redesigned a standard wheelchair with a scissor lift driven by a worm gearbox and hand crank. The fabrication of the Child Lift Wheelchair was completed in the College of Engineering Machine Shop.

## **An Experience in Communicative Language Teaching**

Margaret Hirchak with Dr. Patricia Jane Hamel  
Linguistics  
University of Wyoming  
Oral Presentation

*UW Honors Program*

*Fort Washakie, WY*

Research involves the practicality of implementing the communicative approach to language teaching. Three elements are specifically analyzed in regards to the communicative approach's value: the students' learning style, the students' cultural background, and the impact of the students' motivation and personality in the success of the acquisition of the target language. Specifically, the research indicates that communicative language classrooms; 1), emphasize the use of kinesthetic activities which are the primary learning style preference among students; 2), incorporate the target language culture (in this case, American) into the classroom which has been shown to improve student motivation and interest; and 3), use elicitation procedures to boost the students' initiative to interact in the L2 as well as eliminate the possibility for less extraverted students to be overshadowed by dominant students. Therefore, in essence, the following text will attempt to illustrate the degree to which the communicative approach accommodates the issues within the three previously mentioned elements of analysis.

## **Spidracin, a Silk Degrading Enzyme of Spiders**

Kristen Horner with Dr. Pamela Langer

Molecular Biology

University of Wyoming

Oral Presentation

NSF EPSCoR

*Big Horn, WY*

Major ampullate silk, used in spider webs and draglines, is an unusually strong, elastic fiber that is very protease resistant. The Langer lab, at the University of Wyoming, has identified an enzyme, Spidracin, which is capable of degrading major ampullate silk from the digestive fluid of the golden silk spider, *Nephila clavipes*. The gene encoding this enzyme has been cloned, sequenced, and expressed as a recombinant protein that degrades solid major ampullate silk fibers in vitro. In order to analyze the properties of the enzyme that contribute to its ability to degrade solid silk fibers, an understanding of its structure is necessary. My project was to evaluate the homogeneity of this silk-degrading enzyme by using two-dimensional western blotting and gel zymography. My goal was to determine if preparations of isolated, refolded Spidracin were sufficiently homogeneous for crystallization. I analyzed purified recombinant Spidracin using an anti-Spidracin antibody to detect protein separated with two-dimensional gel electrophoresis. Additionally, I determined which isoforms of Spidracin had proteolytic activity using a substrate gel electrophoresis technique called fluoresceinated gel zymography. These preparations were then compared to the same electrophoretic profiles of *Nephila clavipes* digestive fluid.

## **Internal Disharmony within the Japanese Empire: Economic and Public Relations Issues for Military Colonization, 1930's-1941.**

Jessie Hughes with Dr. Michael Brose

History

University of Wyoming

Oral Presentation

*History Department*

*Bullhead City, AZ*

The focus of this research deals primarily with analyzing the economic and financial justification of an expanding resource base in Manchukuo and Northern China by the Japanese. This will determine whether the colonization of mainland Asia was more detrimental to the Japanese than what was reported at the time by the army clique and whether the army had the widespread support at home for both colonization and conflict.

Records of the Japanese industries in Manchukuo indicate a shortage of small and medium sized businesses and investors willing to advance the industrialization of the region. These shortfalls in investment, combined with continued economic troubles at home signify a difficult position for the pro-army faction.

Since the end of the Pacific War a debate about the true intentions and internal harmony of the Japanese Empire has been published by numerous western authors. This paper will instead attempt to clarify the arguments and voices given by the many factions within the Japanese military and government using records kept by the Japanese on Manchukuo material production and by diaries of key government figures, as well as journals from Japanese scholars writing about these topics as they were in development.

## **A Comparison of the Effects of Two Sweeteners on Postprandial Thermogenesis**

Stephanie L. Hunter with Dr. Enette Larson-Meyer

Family & Consumer Sciences

University of Wyoming

Oral Presentation

*UW Honors Program*

*Fairview, WY*

It is suggested that increased per capita consumption of sugar/sweeteners may play a role in the rising prevalence of obesity in the United States. However, recent studies indicate that consumption of a particular natural sweetener is not associated with the same obesogenic effects of other sweeteners and that it may help promote body weight regulation. In one study, rats fed this natural sweetener for six weeks gained 16.7% less weight than rats fed isocaloric quantities of other sweeteners.

The purpose of this project is to determine if the natural sweetener in question has a greater thermic effect and thus contributes to weight regulation via an increase in total caloric need. Preliminary data from a newly initiated study will be analyzed to assess postprandial oxygen consumption, or the thermic effect of food (TEF), following the consumption of one of two meals—either an experimental meal which contains the natural sweetener or a control meal which contains a common sweetener. Participants in the study are healthy, non-obese and never-pregnant females, aged 18-30 years. The test diets are consumed in random order every four to seven days according to participant's follicular phase of menstruation. Participants undergo resting metabolism, ghrelin/PYY response and TEF measurements.

## **Cell/Mobile Phone Etiquette:**

**Reduction of ambiguous social norms through**

**cognitive dissonance (CD) and technology-mediated communication (TMC)**

Deborah A. Hutchinson with Dr. Frank E. Millar and Dr. Cynthia L. Price

Department of Psychology

Department of Communication and Journalism

University of Wyoming

Poster Presentation

*McNair Scholars Program*

*Westbury, Long Island, NY*

With the ambiguity of cellphone etiquette, public space has become a battleground for *no-talk* zones and *yellular* calls; the “our vs. their” expectations of quietude; the distinction between luxury and necessity; and the fine-line separating amusement from annoyance. This pilot study will examine this social concern by gathering responses from campus faculty, staff, and students; analyzing perceived appropriateness of public cellphone usage; and evaluating if cognitive dissonance (CD) affects respondents’ beliefs and values, as measured by technology-mediated communication (TMC) surveys. This research hypothesizes statistically significant changes between the initial and secondary responses of participants exposed to CD; and between the participants’ secondary responses and their conformity to prescribed norms. Via computer-randomized assignment, participants will provide geo-demographics, rate appropriateness of cellphone usage and etiquette; and write about cellphone usage policy in enclosed public places. To create CD, instructions will require half of the grouped participants to respond in opposition to their previous responses; the other half to chose between topics. All respondents will review appropriate cellphone etiquette and then complete reworded cellphone appropriateness questions; then researchers will compare pre- and post-dissonance responses. The importance of this study is to provide a model for developing social norms for current and future technologies.

## **SCHLOMIX – A Modular Web Management System**

Rory Jarrard, Dan Leaming, Loren Schlorer with Dr. Jeffery Van Baalen

Computer Science

University of Wyoming

Oral Presentation

Computer Science

Laramie, WY

The SCHLOMIX Web Engine is a modular web management system, encompassing content management, user management and presentation management. Built on modern web technologies, (Object Oriented PHP, CSS, XHTML, Javascript,) SCHLOMIX allows anyone with minimal programming experience to add dynamic content and functionality to their website.

SCHLOMIX installs easily on to any web server (Apache, IIS) and connects to many different types of persistent data storage, (MySQL, MSSQL, MSACCESS, Postgres, ODBC, etc.) Adding additional functionality to SCHLOMIX is as easy as downloading pre-built modules (picture albums, blogs, calendars, etc,) or creating your own. The SCHLOMIX backend allows you to install and configure these modules for use on your websites. To make use of the new functionality, simply add a few special tags into your XHTML markup.

For a few years now, CowboyBookSwap has been an excellent service for students of the University of Wyoming, allowing them to buy and sell their used text books directly with other students, removing the Bookstore as a middleman. It allows students to save money when buying used books, and earns them more money when selling. As a SCHLOMIX proof of concept demonstration, we have created modules for CowboyBookSwap version 3.0 and will demonstrate the SCHLOMIX Web Engine with the construction of CowboyBookSwap.

## **Genetic Consequences of Rarity**

### **Among Plant Species in the Genus *Penstemon***

Brittany Jenkins with C. Alex Buerkle

Botany Department

University of Wyoming

Oral Presentation

NSF EPSCoR

Great Falls, MT

The genus *Penstemon* includes over 240 plant species in North America, which range from rare and geographically restricted to common and widely distributed. Whether rare taxa are genetically depauperate compared to common congeners is unclear; depending on the mating system and population structure, rare species may harbor as much diversity as common species. To fill this gap in our understanding, we are using genetic markers to quantify and compare genetic variation among rare and common species in the genus *Penstemon*, which will provide a more thorough understanding of the relationship between rarity and the erosion of genetic variation. Our analyses will also be informative for future conservation management plans for the rare taxa within this genus.

Variation in three common and five rare *Penstemon* species is currently being assayed with seven microsatellite loci and a noncoding region of the chloroplast genome. I have completed these assays for *P. haydenii*, the only endangered plant species in Wyoming. We observed fixed differences in the chloroplast region and strong differentiation among the microsatellite loci between Wyoming and Nebraska populations. I will present our analysis of these data in conjunction with microsatellite and chloroplast DNA data for the other focal *Penstemon* species.

## **Parasitology – Practicing Science in the Secondary Science Classroom**

Stephanie Jensen with Dr. Dagmara Motriuk-Smith, and Dr. R. Scott Seville

Department of Zoology and Physiology and University of Wyoming/Casper College Center

University of Wyoming

Oral Presentation

*NSF EPSCoR WySTEP*

*Casper, WY*

The research conducted by the resident teacher involved isolation of DNA from intestinal protozoan parasites in the genus *Eimeria* (Apicomplexa: Eimeriidae). Fecal samples collected from Wyoming ground squirrels (*Spermophilus elegans*) and black-tailed prairie dogs (*Cynomys ludovicianus*) were screened for the presence of *Eimeria species*. Isolated parasite infective bodies (oocysts) were identified to species based on standard morphological characteristics. Two species, *Eimeria callospermophili* and *Eimeria vilasi*, were recovered and identified. Oocysts were isolated and concentrated by a series of washings and flotations. DNA extraction and PCR amplification were conducted and the generated DNA sequences will allow for elucidation of the evolutionary relationships of the recovered *Eimeria* species. During student teaching the research techniques learned and developed above were brought into a high school biology classroom and used to introduce the concepts of transcription, translation, and recombinant DNA technology. *Escherichia coli* cells were transformed with the pGLO plasmid containing green fluorescence protein gene (GFP). GFP expression was detected by exposure to UV light. The unit developed was implemented in a high school biology course and included the theoretical background and hands-on activities for 50+ students. The depth of topics covered and data analysis was adjusted depending on grade level of students.

## **Effect of Aflatoxin Exposure on Reproductive Potential of Immature Male Mice**

Amanda Kaiser and Kristi Cammack

Department of Animal Science

University of Wyoming

Poster Presentation

*University of Wyoming Office of Research*

*Cedar Park, TX*

Effects of chronic aflatoxicosis on mature male fertility have been reported in many livestock species. However, the effects of aflatoxin exposure on immature, developing males are unknown. The purpose of this experiment is to determine the effects of a chronic aflatoxin exposure on reproduction traits of male mice treated prior to maturation. To accomplish this, immature (n = 8) and mature (n = 8) male mice were used. One-half of the immature mice and one-half of the mature mice were injected subcutaneously with a corn oil:ethanol solution (95:5, v/v) as controls and the other half of each age group were injected with a corn oil:aflatoxin solution at a daily dose of 50 µg/kg body weight for 3 weeks. At the end of the three week injection period, all mice will be euthanized and testis tissue will be collected for laboratory analyses. Testis tissues of control and aflatoxin-treated males will be tested within age groups, and tissues of aflatoxin-treated immature and mature males will also be compared. Results from this experiment are expected to provide novel information regarding the effects of a short-term aflatoxin exposure on the reproductive potential of immature males.

## **Learning Science Through Inquiry: The Nature of Science**

Andrew D. Kaman with Kusum Naithani

Department of Botany

University of Wyoming

Oral Presentation

*NSF EPSCoR WySTEP*

*Lusk, WY*

Inquiry-based teaching is central to the National Science Education Standards as well as the Wyoming State Education Standards. However, many teachers hesitate to teach science through inquiry because they did not learn this way themselves. Teaching and learning through inquiry promotes deep understanding of science concepts, active communication and high engagement in learning science. Students working in an inquiry setting are practicing science as ‘true scientists’.

Through my WySTEP fellowship I was able to gain a greater appreciation for the scientific process and in doing so strengthening my skills as an inquiry based educator. My presentation is going to look into the benefits of inquiry-based science education as well as the ways that I have tried to incorporate scientific inquiry into my curriculum.

## **Frolfing Frisbee Finder**

Daniel Kasmiskie with Dr. Stanislaw Legowski

Electrical and Computer Engineering

University of Wyoming

Oral and Poster Presentations

*Electrical and Computer Engineering Senior  
Design*

*Edina, MN*

If you have ever played Frisbee Golf you know that finding your disc is sometime difficult, if not impossible. Losing discs is disappointing and expensive, so I set out to find a solution to the issue of loosing discs when frolfing.

The first problem I faced when building my device was the communication method between the disc and receiver. I luckily found an inexpensive transmitter receiver pair for the frequency of 434 MHz. Later I learned that this was not quite enough so I researched farther and found a logarithmic amplifier that would output a DC voltage corresponding to the dB level of the high frequency input it received. From this DC voltage I am able to back out the distance the disc is away from a simple equation or look-up tables that I will create from experiments.

Initial tests show the range capability to be about 15 yards I was hoping for a much greater range. With further testing I will hopefully be able to fix this issue and make my product marketable.

**Evaluating Program Design  
via Automated Constraint Detection**  
Yuki Kawabe with Dr. Ruben Gamboa  
Computer Science  
University of Wyoming  
Oral Presentation

*Supported by NSF*

*Laramie, WY*

Whenever professional programmers describe great program code, they emphasize the importance of designing programs that are easy for other programmers, including themselves months or years later, to understand. Program design comprehensibility measures how easily people can understand the program design. It appears to be subjective, but in this research, I will show that program design comprehensibility can be evaluated mechanically. We extract program constraints from a program using ContExt, a hybrid static/dynamic constraint detecting tool. In several experiments, ContExt produced different numbers of program constraints and information for each program design. The extracted constraints form an abstract model of the program design, which we evaluate using Alloy Analyzer, a bounded model checker. Alloy can determine if certain properties hold in the model. To evaluate design comprehensibility, we check whether the extracted model has properties that we know the original program has. If the extracted model is complete enough, the properties are validated, which means that the program design is comprehensible to the model checker. However, if the model has large gaps, the model checker generates counter examples which do not obey original program properties. Thus, the program design is not comprehensible to the model checker.

**Enhanced Oil Recovery Decision Space with Fast Screening and Simulation**  
Curtis Kitchen with Dr. Vladimir Alvarado  
Petroleum Engineering  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Calgary, Canada*

This presentation summarizes research conducted during the summer of 2007 for the project “Enhanced Oil Recovery Decision Space with Fast Screening and Simulation”.

The main objective of this research was to determine if it is possible to develop a framework that would enable users to run a reservoir simulator through decision analysis software, use outputs from the simulator to perform calculations in Excel and then have the results from Excel correlated and displayed by the decision analysis software. This was accomplished by gaining knowledge of the intricacies of each type of software, then developing a system that would allow them to intermingle and produce a practical product that could be utilized by an oil company.

Enhanced Oil recovery is used in the majority of the current Petroleum Operations. These projects have high levels of uncertainty. By utilizing decision analysis techniques we can project the results from the simulations in a business type manner and make it easier for executives to make decisions.

## **Dye Synthesis for Use in a SERS-based West Nile Virus Assay**

Jan-Pablo Kollmar with Dr. Robert C. Corcoran,  
Chemistry  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Iowa City, IA*

The current methods for identification of West Nile Virus have several limitations: they are slow, often require bulky or fragile equipment, and are not useful for real-time field-based detection. The SERS (Surface Enhanced Raman Scattering) based assay being designed by the Corcoran group and collaborators would allow for fast, efficient detection of West Nile Virus. This assay requires several dyes that are “tethered” to oligonucleotide sequences. Constructing these tethered-dyes has been the focus of my research, and has required a broad range of synthetic and spectroscopic techniques. These products will be an integral part of the SERS assay, and will allow for greater characterization and containment of West Nile Virus.

## **Blood Lactate and Heart Rate Recovery in Exercised Horses**

Carlie Koonce with Dr. Brenda Alexander and Enette Larson-Meyer  
Animal Science and Family and Consumer Sciences  
University of Wyoming  
Poster Presentation

*Problems in Animal Science*

*Carol Stream, IL*

Many studies have demonstrated that training has a predictable effect on heart rate and blood lactate concentration following submaximal exercise: as training increases fitness, both physiologic traits decrease at any given work speed. Thus, over time, the horse is able to work faster at the same heart rate, while decreasing recovery time and delaying the onset of fatigue due to lactate accumulation.

The purpose of this study was to produce these physiological changes in unfit pleasure horses by means of cardiovascular conditioning. Five winter-condition Quarter Horses were subjected to a regime of regular and gradually increasing workouts at a trot and canter three days weekly for eight weeks. Post-exercise heart rate and blood for lactate analysis were collected following a standardized exercise test pre-, mid-, and post-conditioning. It is expected that training will decrease working and recovery heart rates, while reducing post-exercise lactate accumulation.

**Variability in Malar Morphology:  
Osteometric Identification of Race**  
Jani Kovach with Rick Weathermon  
Anthropology  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Laramie, WY*

Osteometric analysis of human skeletal remains is one of the most accepted forms of identification in the fields of archaeology, forensic anthropology, physical anthropology, and law enforcement. Its use aids the professional in the identification of missing persons based on classification by race, and can contribute to effective facial reconstructions.

This research, being the first of its kind attempted since T.L.Woo's 1937 study of human malars, and the only project that specifically looks at osteometric differences between American Indians and Caucasoids, is of vital relevance today. Information derived from this study, combined with existing literature, will provide an expanded practical foundation useful for identifying racial variation.

**Reintroduction of a species: Using GIS Suitability Analysis to Find Environments for Species Reintroduction**  
Ellen Lark with Jeff Sun  
Geography Department  
Casper College  
Oral Presentation

*Casper College*

*Casper, WY*

One method of boosting populations of endangered species is the use of captive populations to increase numbers. A problem with this method is that the captive population eventually has to be released into the wild and has to survive there. Even with a good knowledge of species needs, this can be time consuming and may not succeed. By mapping suitable environments using spatial analysis, areas for release might be better determined. This type of data analysis could potentially also be used to determine where remaining wild populations might be found.

In this project, a threatened subspecies of amphibian, the Chiricahua Leopard Frog (*Rana chiricahuensis*) provides the basis for a GIS suitability analysis. This species is an amphibian that is associated with riparian areas in sky islands of Arizona. Because it is only threatened, there is a fair amount known about it and its environment. Thus, it is possible to see if this type of suitability analysis will give a reasonable approximation of areas that are useful for reintroduction. Several factors such as elevation, human access to the area under consideration, stream access and sightings of wild populations have been used as a basis for this analysis.

## **Speaking Out: Experiences of Native American Students on a Predominately White Campus**

Amanda LeClair with Dr. Angela Jaime

English

University of Wyoming

Poster Presentation

*McNair Scholars Program*

*Ft. Washakie, WY*

The objectives for this study comes twofold; affirming my own experiences as a Native student in American Indian Studies courses, and documenting the experiences of other Native American students in these courses taught on a predominately white campus. This study will be qualitative in nature; my narrative and one-on-one interviews with the participants. The research in this study will include social and academic experiences of Native American students and one Native American professor at the University of Wyoming. Coding will be based whether or not these students have had similar experiences in these classes. I will also be looking for whether or not their experiences are related to mine. The importance of this study is to raise the consciousness of non-Native students and professors about the experiences of Native students and the issues they face in American Indian Studies courses on a predominately non-Native campus.

## **Integrating Scientific Research Experience into the High School Chemistry Classroom**

Tamara Lehnertz with Erin Hotchkiss

Secondary Education and Chemistry

University of Wyoming

Oral Presentation

*NSF EPSCoR WySTEP*

*Littleton, CO*

As part of my summer 2007 EPSCoR project, I spent extensive time helping Erin Hotchkiss, a graduate student in Biology, with her thesis research in stream ecology. As I am a chemistry-education major, I found my research experience to have many benefits that I can integrate into my future classrooms. Since all scientific knowledge comes from research, an understanding of how field research is actually conducted is necessary as a science teacher.

The goal of the EPSCoR-endorsed Science Teacher Education Program (STEP) is to give future science teachers research experience and help them learn how to integrate such experience into their science classrooms. I am currently student-teaching in a chemistry classroom at Laramie High School for my final semester at UW. I have started to integrate my research experience into my classroom by planning several activities that involve students in scientific research. During my oral presentation, I will further explain my research experience, how it has affected my teaching, and how I plan to use specific activities to enhance students' overall understanding of science.

## **Cardiac Toll-Like Receptor 4-deficiency Limits Ischemic Injury via Up-regulation of AMPK and Down-regulation of p38 MAPK**

Jing Li with Dr. Ji Li

Department of Pharmaceutical Sciences

School of Pharmacy

University of Wyoming

Oral Presentation

NSF EPSCoR

Laramie, WY

**BACKGROUND:** Toll-like receptor 4 (TLR4) is expressed in the heart and vasculature, when deficient, has been shown to protect the heart against ischemia/reperfusion injury. But the molecular mechanisms of the cardioprotection against ischemic damage of TLR4-deficiency remain unclear.

**AIM:** This study determined whether the cardioprotective effects of TLR4-deficiency may function via activation of AMP-activated protein kinase (AMPK) and/or mitogen-activated protein kinase (MAPK) signaling pathway.

**METHODS:** *In vivo* regional ischemia was induced by occluding the left anterior descending (LAD) coronary artery in wild type (WT) C3H/HeN and TLR4-deficient C3H/HeJ mice. Immunoblotting analysis was performed to measure the activation of AMPK and TLR4 downstream, p38 MAPK.

**RESULTS:** Intriguingly, the TLR4-deficient C3H/HeJ hearts demonstrated impaired AMPK and p38 MAPK activation compared to WT C3H/HeN hearts, i.e. activation of p38 MAPK ( $\text{Thr}^{180}/\text{Tyr}^{182}$  phosphorylation) were blunted and activation of AMPK ( $\text{Thr}^{172}$  phosphorylation) were augmented during ischemia in C3H/HeJ hearts vs. C3H/HeN hearts ( $p<0.01$ ,  $n=6$  each). Moreover, the AMPK downstream acetyl CoA carboxylase (ACC)  $\text{Ser}^{79}$  phosphorylation induced by ischemia was augmented in C3H/HeJ hearts as well compared to C3H/HeN hearts ( $p<0.01$ ,  $n=6$  each).

**CONCLUSION:** TLR4-deficiency blunted downstream inflammatory signaling like p38 MAPK pathway, and augmented cardiac AMPK signaling pathway to protect against ischemic injury.

## **Neurokinin 3 receptors role in osmoregulation**

Jonathan Lind with Dr. Francis W. Flynn

Zoology and Physiology

University of Wyoming

Oral Presentation

NSF EPSCoR

Denver, CO

The control of blood osmolarity requires cooperation of several physiological systems. One of these systems is neurohormonal. This neurohormonal system involves specific neurons, located in the middle of the brain, in an area known as the paraventricular nucleus. These neurons have receptors on their surface known as neurokinin 3 receptors. NK3R. To investigate the role of these receptors in the process of osmoregulation, they were blocked and then the rest of the pathway was stimulated and monitored for downstream effects. The experiment involved many different disciplines, including: biology, chemistry, physics, neuroscience, physiology, surgery, biochemistry and others. The results were conclusive. NK3R and its ligand play a central role in the release of two hormones, oxytocin, and vasopressin.

## **Biological Functions of Superoxide Dismutase and Peroxide Catalase in Cyanobacteria**

Matthew Link with Dr. Stephen Herbert

Botany

University of Wyoming

Poster Presentation

*NSF EPSCoR*

*Cheyenne, WY*

Cells maintain a homeostasis of reactive oxygen with dynamic systems of enzymes and other molecules collectively known as antioxidants. Two types of antioxidants, superoxide dismutases and catalases, are thought to work together in microbial cells to limit HO·, which results from reaction between O<sub>2</sub><sup>-</sup> and H<sub>2</sub>O<sub>2</sub>. HO· is a very strong oxidant capable of oxidizing most biological molecules.

Cyanobacteria are an appropriate model system for studying the role played by antioxidants in oxygen-evolving photosynthetic systems. They are easy to grow and modify genetically. *Synechococcus sp.* PCC 7942 was used in this study because it is believed to have a single superoxide dismutase and a single catalase, as well as being the only photosynthetic organism in which a mutant lacking superoxide dismutase has been created.

SodB is an iron superoxide dismutase that may exist in association with Photosystem I in chloroplasts and cyanobacteria. SodB catalyzes the conversion of O<sub>2</sub><sup>-</sup> (a byproduct of photosynthesis) to H<sub>2</sub>O<sub>2</sub>. KatG is a peroxide catalase which converts H<sub>2</sub>O<sub>2</sub> to H<sub>2</sub>O and O<sub>2</sub>. H<sub>2</sub>O<sub>2</sub> that is detoxified by KatG may derive from the action of SodB or from external sources such as other organisms. The physiological functions of these two antioxidants were investigated through the application of paraquat, an herbicide known to kill by generating O<sub>2</sub><sup>-</sup> at the reducing side of Photosystem I.

## **Parental Influence on Youth Physical Activity: Comparing Parent-Child Perceived Competencies and Participation Motives**

Maria Long with Dr. Brandon Alderman

Division of Kinesiology and Health

University of Wyoming

Oral Presentation

*NSF EPSCoR*

*Laramie, WY*

Regular physical activity is associated with a reduction in risk for coronary heart disease, cancer, and other negative health conditions. However, many adults do not engage in sufficient amounts of physical activity. In an attempt to curb adult sedentary lifestyles, experts have stressed the importance of examining determinants of youth physical activity. One area that has received increasing attention is the role of the family, particularly parents, in promoting positive physical activity experiences for children.

A positive association between parents' and children's activity levels has been reported; however, the exact nature of this relationship remains unclear. Further, there has been relatively little attention to the role fathers play in their children's activity. Therefore, the purpose of this study was to examine several components of a model proposed to explain parental influence on children's physical activity, paying particular attention to fathers. Parents and children were asked to wear a Digi-Walker pedometer for 7 consecutive days to attain an objective measure of physical activity and were asked to complete a questionnaire assessing their beliefs about physical activity. The findings from this study should add to the extant knowledge base of parental influence on youth physical activity.

## **New Asthma Guidelines: How Will They Affect Patient Care?**

Jill Loschen with Dr. Jennifer Petrie

School of Pharmacy

University of Wyoming

Oral Presentation

*UW Honors Program*

*Worland, WY*

Research to be addressed is the issue of the clinical importance and relevance of the National Heart, Lung, and Blood Institute's (NHLBI) and National Asthma Education and Prevention Program's Expert Panel Report 3: Guidelines for the Diagnosis and Management of Asthma. Specifically, the research will address whether or not the new guidelines will change therapy based on a patient's asthma classification to obtain greater control. Data being used was collected at the Downtown Clinic (DTC) of Laramie, Wyoming.

Asthma affects nearly 22 million individuals in the United States alone, causing 3,816 deaths in 2004. Asthma is an incurable disease state that requires lifelong treatment. The NHLBI and National Asthma Education and Prevention Program provide guidelines in attempt to better treat this condition. Understanding how to adequately treat asthma is important in clinical practice.

Comparing the 2001 guidelines to the new 2007 asthma guidelines will help determine if patients are being adequately treated and if the changes made in the new guidelines will make significant impact on clinical practice. This paper will attempt to determine whether the new asthma treatment guidelines will significantly change clinical practice and the treatment of asthma using data collected from the DTC's patient population.

## **Embedded Stereo Vision Based Obstacle Avoidance**

Geoffrey Luke with Dr. Cameron H. G. Wright

Department of Electrical and Computer Engineering

University of Wyoming

Oral Presentation

*Wyoming Space Grant Consortium*

*Cheyenne, WY*

The focus of this research was to develop an embedded stereo vision system in order to control a mobile robot platform. A stereo vision algorithm was developed in Matlab and tested on sample images. The algorithm must operate in real time, so a number of optimization techniques have been used, and only a small subsection of the image is processed. After the stereo vision algorithm was finalized in Matlab, it was implemented on an embedded system.

The embedded system consists of two cameras and a microcontroller. The cameras periodically take pictures. The microcontroller then compares the two pictures and determines the distance to objects based on their displacement between the two images. Finally the microcontroller adjusts the motion of the robot to avoid any obstacles in its path.

## **P-1 and P+1: The Search for Stronger Pseudoprimes**

Daniel Peterson and Christopher MacLellan with Dr. Siguna Mueller and Dr. Ruben Gamboa  
Mathematics  
University of Wyoming  
Oral Presentation

*Wyoming Cryptography School*

*Cheyenne, WY*

We discuss the attempt to construct a composite likely to be passed as prime by statistical primality tests. In particular, we attempt to construct a squarefree composite with  $p-1|n-1$  for all  $p|n$ , and  $p+1|n+1$  for all  $p|n$ . This construction is found by sieving for primes conducive toward the desired product. The sieve conditions and sieve implementation are focused on in detail.

## **A Computational Study of Stochastic Models in Finance**

Christopher MacLellan with Dr. Professor Sivaguru S. Sritharan  
Mathematics Department  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Cheyenne, WY*

Background information will be provided on Brownian motion and where it originated from. I will then explain Geometric or Exponential Brownian motion and show computer graphs / simulations of these motions. I will then explain the assumptions that need to be made to model Black-Scholes Call and Put options. Once these assumptions are explained I will show the equations used and the computational simulations of a Call and a Put option and explain what they mean.

## **Production of Engineered Spider Silk in *Escherichia Coli***

Seth Matherne with Dr. Randy Lewis  
and Dr. Florence Teulé  
Molecular Biology  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Riverton, WY*

*Escherichia Coli* bacteria are model organisms in modern day microbiology. They are easy to manipulate and control, exhibit rapid development with short life cycles, and are readily available. *E. coli* bacteria are commonly used for gene expression of protein motifs for research.

Using *E. coli* bacteria, synthetic spider silk proteins were expressed. After expression the proteins were extracted and purified. The purity and presence of the protein was established by Western Blot analysis.

## **The Search For Circumstellar Disks Around Main-Sequence Stars**

Emily May with Dr. Henry Kobulnicky

Physics and Astronomy

University of Wyoming

Oral Presentation

*NSF EPSCoR*

*Casper, WY*

The spectra of eleven stars chosen from the Spitzer Space Telescope Galactic Legacy Infrared Mid-Plane Survey Extraordinaire (GLIMPSE) are studied to determine reasons for excess infrared radiation. The optical spectra were obtained over a wavelength range of 5300-6800 Å using the longslit spectrograph on the 2.3 meter telescope at the Wyoming Infrared Observatory (WIRO). Through classification and identification of key emission/absorption lines, new debris disks may be discovered around these stars. Debris disks form after the initial disk from which the star came is almost depleted and are of interest because they are thought to be the sight of planetary formation.

Of the eleven stars included in this study, eight of them show signs of having circumstellar disks. The other three display H $\alpha$  emission lines. In these cases, the excess radiation is thought to be caused by bremsstrahlung emission from ionized gases. Therefore, we are left with eight stellar spectra displaying excess infrared radiation that could be caused by excess dust around the star in a circumstellar disk. Here we present the spectra of these eight stars and their classifications. Also, the other three spectra are presented and it is explained why they are not candidates for debris disk systems.

## **Exploring Methods for Determining Gut Microbial Composition in Crohn's Patients**

Sage McCann with Dr. Naomi Ward

Molecular Biology

University of Wyoming

Oral Presentation

*INBRE Transition Scholarship Program*

*Laramie, WY*

Crohn's is an inflammatory bowel disease that predominately affects the lower intestine; research suggests that it is caused by genetic defects in the autoimmune response. It is not known whether exposure to specific pathogens, or if genetic predisposition alone in the presence of normal gut flora leads to Crohn's symptoms. A key component to answering this question is the comparison of enteric microbial composition of healthy individuals versus that of Crohn's patients.

Methods being evaluated for the determination of enteric microbial composition are: RFLP/T-RFLP analysis, sequencing, and micro array phylotyping. Restriction digests have been performed and analyzed using the BioRad Experion system as well as fluorescent T-RFLP; we are also waiting for the first phylochip data to come back. The next step will be the construction of clone libraries and sequencing. It is too early in the research to determine the superiority of one method to another.

Sequencing from clone libraries will give the most data; however, it is costly and time consuming – not suitable for clinical applications. An effective RFLP or micro array would be faster; the question is whether or not either application is sensitive enough to be used as a diagnostic tool.

## **Microbial Diversity at Hot Springs State Park, Thermopolis, WY**

Sage McCann with Dr. Naomi Ward  
Molecular Biology  
University of Wyoming  
Central Wyoming College  
Poster Presentation

NASA Space Grant/INBRE

Laramie, WY

A complete study of the microbial communities at Big Spring in Hot Springs State Park, Thermopolis, Wyoming is lacking. A previous study using culturing methods (Statwald-Demchick et al. 1990) did report the presence of purple non-sulfur bacteria *Rhodobacter* and *Rhodopseudomonas* – there was, however, no other mention of the Thermopolis hot spring. The goal of this project is to use cultivation-independent genetic techniques to assess microbial diversity and determine major taxa.

Sample sites from the main spring and its effluent were chosen based on two superficial characteristics – pigmentation and growth morphology. 16S rRNA genes from nine samples were PCR-amplified and digested with restriction enzymes; the resulting RFLP (restriction fragment length polymorphism) patterns were compared and grouped based on their similarity. Two samples representing two different RFLP groupings were chosen to generate clone libraries; ten colonies were picked from each library for partial sequencing.

These partial 16S rDNA sequences from a small number of colonies cannot be used to assess total diversity; however, they will provide some initial taxonomic data, as well as an idea of how many more clones need to be sequenced to adequately capture microbial diversity of the proclaimed world's largest mineral hot spring.

## **Communication Device for People with Hearing or Speaking Limitations**

Daniel McCarthy and Jon Ngai with Dr. Stanislaw Legowski  
Electrical and Computer Engineering  
University of Wyoming  
Oral Presentation

*UW Honors Program and UW Engineering*  
*Under the Volpi Cupal ECE Senior Design Fund*

Rock Springs, WY

A person with a hearing and/or speech limitation often needs an assistive device to communicate. Our device presents a method in which such a person can easily communicate with another person. Our design is meant to improve upon a similar system (The Lightwriter marketed by Toby Churchill) that the Wyoming INstitute for Disabilities (WIND) currently has. Our device is a battery powered standalone unit that uses two standard PS/2 PC keyboards to receive text from its users. This text is then displayed on two LCDs (one for each person to view). Finally, the text entered by the primary user (the person with the hearing or speaking limitation) is spoken by a text to speech converter.

## **Influence of physical activity and body composition on oxidative stress and inflammatory biomarkers.**

Lyle McKissick with Dr. Derek Smith  
Kinesiology  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Jackson, WY*

Regular Physical Activity (PA) counteracts many negative effects of obesity such as inflammation and oxidative stress. A habitually PA lifestyle may reduce obesity-related elevations of oxidative stress and inflammatory biomarkers.

**Purpose:** To compare basal levels of oxidative stress (SOD) and inflammation (TNF- $\alpha$ ) in four groups of sedentary, physically active, lean and overweight, young and middle-aged men and women.

**Methods:** 20 lean and 20 overweight (BMI  $>25 \text{ kg/m}^2$ ) sedentary and physically active individuals were allocated into four groups: 1) lean sedentary (LS) =10; 2) obese sedentary (OS) =10; 3) lean physical active (LA) =10; and 4) obese physically active (OA) =10. A fasting blood sample was collected via standard phlebotomy for analysis of oxidative stress and inflammatory biomarkers by ELISA.

**Results:** No significant between group differences were observed for inflammatory (TNF- $\alpha$ ; p=0.45) or oxidative stress (SOD; p=0.51) biomarkers. Group differences were observed for fasting insulin concentrations.

**Conclusion:** The primary findings for this project were significant between group differences for fasting insulin levels, but no measurable differences in inflammation or oxidative stress. The overly null findings may be due to the small sample size or young age of participants in all four groups and concomitantly lower levels of inflammation and oxidative stress. Moreover, no definitive conclusions about the combined effect of PA and adiposity were possible due to the null findings. While previous PA intervention studies have shown improvements in TNF- $\alpha$  with habitual PA (11), the roles of PA and adiposity on SOD have yet to be elucidated.

## **Virgin with a Knife: the Impact of Charlotte de Corday**

Hannah McWilliams with Dr. Walter R. Wall  
Department of Modern & Classical Languages  
University of Wyoming  
Oral Presentation

*UW Honors Program*

*Thermopolis, WY*

This research seeks to discover if Charlotte de Corday's murder of Jean-Paul Marat preceding the Terror of the French Revolution impacted the treatment of women revolutionaries in artwork, laws, and writings throughout the French Revolution. Sources include artwork, texts, and historical documents. Encyclopedia articles, historical texts, and biographies will also be used. Methods for gathering information include taking plentiful notes, maintaining a list of full citation information, creating an annotated bibliography, making copies of documents, and analyzing artwork. To determine if the murder impacted how women revolutionaries were viewed, I documented any laws or writings concerning politically involved women noting how women were treated in these documents. I then analyzed the events that prompted them to determine their connection to Charlotte de Corday and the murder of Jean-Paul Marat. I also studied how female revolutionaries, particularly Corday, were portrayed in paintings at that time.

**Determining the Presence of Stretch  
Receptors in the Dorsal Cutaneous Nerves**  
Kate Messer with Dr. Charles Jeff Woodbury  
Zoology/ Physiology  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Cheyenne, WY*

Research to be addressed is the absence of muscle stretch receptors, muscle spindle afferents, in the 13 dorsal cutaneous nerves innervating the trunk skin between the fore-limbs and hind-limbs. At issue is currently accepted research which suggests that the dorsal cutaneous nerves innervating the cutaneous trunci muscle lack muscle stretch receptors. The idea that the nerves are purely cutaneous has been upheld and has impacted other neuromuscular research for decades.

However, Dr. Woodbury at the University of Wyoming has found evidence contradicting previous findings. The presence of these muscle stretch receptors will prove to have both short and long term benefits. Further understanding will ultimately force the re-evaluation of widely accepted theories on how nerve supply to muscle, both sensory and motor, develops. Additionally, research may prove to have impact on current and future medical practices and the field of neuroscience.

In recent studies there have been many advancements in this area of research. The use of similar techniques implemented in previous studies, such as electrophysiology and immunocytochemistry, will also be applied to this research. Research conducted will attempt to provide support for the presence of the muscle stretch receptors and evidence for the dorsal cutaneous nerves as non-purely cutaneous.

**Isotopic Analysis of  
A Columbian Mammoth's Tusk  
for Climate Reconstruction**  
Annessa Miller with Dr. Mark Clementz  
Geology and Geophysics  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Laramie, WY*

With glaciers melting and species becoming extinct, the Human Race contemplates its affects on a fragile system. While we may understand some chemical interactions within this system, comparatively little is known about how our climate fluctuates. A Columbian mammoth found on private land in Converse County, Wyoming can yield information that will help clarify some of these variations. The goal of this research project, analyzing the stable isotopes of oxygen, carbon and collagen found in the tusk of "Dee the Mammoth", can help in this clarification. The research that has been completed at the University of Wyoming's Stable Isotope Laboratory can bring a larger climatic picture into greater focus.

**Tolkien's Stand Against Modernism**  
Jake Mitchell with Dr. Susan Aronstein  
English  
University of Wyoming  
Oral Presentation

*UW Honors Program*

*Laramie, WY*

This project explores Tolkien's relationship with an important literary movement that occurred during his lifetime and how he does and does not respond to it or acknowledge it. Modernism sparked a series of cultural paradigm shifts ranging from gender roles to class relationships to the reality of war in the modern era and what the future might hold for Western Civilization. Tolkien looks at the various cultural shifts and, quite intentionally, looks into the past for inspiration and strength. The Lord of the Rings is a series obsessed with the past and its fading glories. The text supports homo-social bonds, but decisively ignores homosexual bonds; it provides troublesome racial ideologies and showcases many of the problems with ethnocentric literature. Tolkien sees himself surrounded by a rapidly and violently changing world, and tries very hard to provide a much more traditional counter-narrative to these changes. In many ways, Tolkien uses The Lord of the Rings to combat new ideas about societal order and culture by offering his own, neo-feudalist worldview.

**Metaphysical Space and Its Literary Discourse**  
Shaleena Moy with Dr. Caroline McCracken-Flesher  
English and Honors  
University of Wyoming  
Oral Presentation

*UW Honors Program*

*Sacramento, CA*

What significance does metaphysical space have on the physical world? How does modern literature relate to politics of nation and identity? How does one find meaning in the twisted narrative of spatially bound literature?

These are the questions addressed in this presentation. Beginning with commonly known poet Percy Shelley and combining his 'romantic' ideas with the more jaded nation theorist Tom Nairn, author of "The Modern Janus," this project breaks down the complex novel The Man Who Walks, written by Scottish author Alan Warner, to explore the power of contradictory spaces that transcend physical space—finding form in the metaphysical realm of language and expression in literature.

In answering these questions readers begin to appreciate the meaning and impact of literature. The contradictions raised in the search for answers reveal the true power of literature not to confirm or conform, but to simultaneously contrast and unite differing ideas. As a space of both contradiction and reconciliation the metaphysical space of literature, particularly as seen in Warner's novel, challenges readers to look for spaces of contradiction and find in them the need for action and the means of achieving it.

**Differentiating between effect of disturbance and  
nutrient enrichment on species diversity**

Bonnie Myers with Dr. Carolyn Meyer  
Botany Department  
University of Wyoming  
Oral Presentation

*UW Honors Program and NSF EPSCoR*

*Rogers, AR*

The objective of this study was to determine if fertilization or disturbance accounted for low plant diversity observed on high-use river otter latrines in Prince William Sound, Alaska. I collected vegetation cover data on 53 latrines and grouped sites into high use and low use using fecal counts. Data-driven and literature approaches were used to classify species as colonizers or competitors. According to the data, most species on latrines were negatively correlated with disturbance and appeared to be strong competitors when nutrient inputs were high. The majority of plant species were competitors, suggesting fertilization is the main driving force reducing species diversity. However, the low-use sites should have fewer competitors than the high-use sites, which was not the case. The literature approach produced opposite results, suggesting most species on the latrines are colonizers. Future research should work on correctly identifying the classifications of species in the literature and data because such opposite results suggest errors in the classification assumptions.

**TESTING AND ANALYSIS OF CIRCUMFERENTIAL STRESS-STRAIN BEHAVIOR OF TITANIUM TUBING**

James Nelson with Dr. Mark Garnich  
Department of Mechanical Engineering  
College of Engineering and Applied Science  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Cheyenne, WY*

Titanium alloys are used for hydraulic tubing in modern aircraft because of their excellent properties of specific strength as well as fatigue and corrosion resistance. However, the circumferential material properties of titanium tubing are relatively unknown. The interest in circumferential properties versus the axial properties stems from the strong texture development due to pilgering (Tuber Reducer) combined with the known anisotropy of oriented titanium microstructures.

The goal of the current research was to gain a better understanding of these material properties as they relate to material specifications for industry applications. A unique test fixture was developed for cylindrical specimens. Force-displacement data was collected and used to calculate stress-strain relations. Because of the complex specimen geometry, a finite element model was developed to help relate the measured displacements to the actual stresses and strains. An iterative analysis of the data resulted in an estimate of Young's Modulus of  $18.7 \times 10^6$  psi, a yield stress of 130,000 psi and an ultimate strength of 143,000 psi for 0.5 inch diameter, Ti 3Al 2.5V tubing. The modulus was higher than expected, but these values were within the expected range for this particular titanium alloy and its processing history.

## **Trike Bike Redesign**

Matthew W. Orr with Dr. Stanislaw Legowski  
Electrical and Computer Engineering  
University of Wyoming  
Oral Presentation

*Electrical Engineering Senior Design*

*Laramie, WY*

This project is centered on a previous senior design project from 2002 originally created by a team of mechanical engineers and another team of electrical engineers. The mechanical portion of the project was mostly complete, and only minor changes have been made to the mechanical system of the trike bike. The vast majority of the work has focused on the electrical system.

Because of complications with the previous electrical design, a complete redesign of the electrical system has been the focus of the project. Goals of the project have revolved around reliability, safety, and documentation of the trike bike. The trike bike has been redesigned in such a way that work needing to be done to complete the project is explicit, and documentation is sufficient for future engineers to understand current implementations with minimal effort.

## **Effect of varying rates of controlled-release fertilizer application on growth of *Tagetes patula* ‘Tiger Eyes’**

Aaron K. Ostrom with Dr. Karen L. Panter  
Plant Sciences  
University of Wyoming  
Oral Presentation

*UW Honors Program*

*Cheyenne, WY*

Growers in the greenhouse industry are constantly faced with the challenges of fertility. Most adapt a water-soluble program, however, controlled-release fertilization programs provide a convenient method to consistently deliver nutrients to the crop along with less environmental contamination. More research needs to be done relating to specific species and fertilizer requirements based on individual plant response.

The investigation centered on determining the ideal application rate of Osmocote® Plus, a 3-4 month controlled-release fertilizer, based on growth and overall health of the plant for a variety of French Marigold (*Tagetes patula*), ‘Tiger Eyes’. Twelve test groups along with one control group were established and grown in a greenhouse with varying amounts of product applied. Each group was divided to two subgroups, one with fertilizer evenly incorporated into media and the other top-dressed.

For *Tagetes patula*, it was found that general growth and plant health for the two-month crop did not vary significantly enough between the lower amounts applied and higher rates, up to 12g, to justify additional fertilizer application. Higher application rates simply lead to waste and even signs of toxicity, stunting plant growth. It can be inferred that universally suggested amounts are higher than is required for this particular crop.

## **Automated Insulin Dosage Device**

Beau Palmquist and Joseph Van Court and with Dr. Stanislaw Legowski

Department of Electrical and Computer Engineering

University of Wyoming

Poster and Oral Presentations

*Volpi Cupal ECE Senior Design Fund*

*Cheyenne, WY*

Research is the result of designing a working prototype of an automated insulin dosing device. A large percentage of diabetics in the United States have mobility problems that lead to difficulty in testing their blood sugar levels. Any automation will lead to more accurate and safer testing practices.

The project was the complete design and assembly of everything needed to automate all processes from the blood glucose meter, used to sample blood, to the dosage information and dispensing of Humalog© insulin, for intramuscular injection.

This was done by reading the information that comes out of an Accu-Chek Complete© and determining the proper dosage of Humalog© insulin to be injected. This process will then cause a linear actuator to fill an insulin syringe with the correct dosage, and after checking the dosage the user will be able to inject themselves.

## **Nonverbal Social Behavior of Depression in Adults with Mild Intellectual Disability**

Abbie Patik with Sigan Hartley Ph. D., and William MacLean Ph. D.

Psychology

University of Wyoming

Poster Presentation

*Psychology Department*

*Casper, WY*

There is a high frequency of depression in people with Intellectual Disability (ID). Unfortunately, very little research has been conducted to investigate depression in this particular population. In the general population, however, much research has been performed and researchers have concluded that depression is generally characterized by noticeable deficits in nonverbal communication. These nonverbal behaviors cause adverse reactions in others and induce negative social responses. At issue in this study is whether or not the depressed adults with mild ID demonstrate similar nonverbal communication deficits as the depressed general population. Twenty-four adults with mild ID, 12 depressed and 12 non-depressed, were video-taped in a semi-structured interview format. Two coders, who were naïve to group membership, coded the interviews for various nonverbal behaviors. As predicted, the results showed that the depressed adults with mild ID had less facial expressiveness, spoke in a quiet, flat, and unemotional tone, responded slower to questions and made less eye contact than the non-depressed adults with mild ID. These finding have many implications including the understanding and construction of intervention techniques and treatment options for depression in the ID population.

**Synthesis of a Simple Predecessor of RNA and DNA**  
Jeremy Pepin with Dr. Brian Francis and Dr. John Hoberg  
Chemistry  
University of Wyoming  
Oral Presentation

*NASA Space Grant Consortium*

*Hot Springs, SD*

The research performed is to study possible precursors of RNA and DNA. Genetic materials are very complex polymers which are able to carry information in the form of base sequences. Due to the complexity of RNA and DNA polymers, it is reasonable to believe that they arose by evolution from much simpler polymers.

Malic acid is a simple molecule that is found in the citric acid and glyoxylate cycles at the center of biochemical metabolism, and it can also form a simple linear polyester named poly-beta-malic acid. A hypothesis proposed by Dr. Brian Francis is that RNA and DNA may have arisen via a series of evolutionary modifications of poly-beta-malic acid. The conducted research is to synthesize a derivative of this polymer and study its intrastrand and interstrand hydrogen bonding.

In recent years there has been a great effort in the search of life elsewhere other than Earth. Currently, the methods of searching for life include geothermal studies and soil sampling to test for microorganisms. If the proposed hypothesis is correct, NASA and other countries may be looking for biological information molecules that are too complex; searching for these simpler polymers could lead to the discovery of life in places other than Earth.

**The Development and Analysis of a Merging Stream Cipher**  
Daniel Peterson with Dr. Siguna Mueller  
Mathematics  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Cheyenne, WY*

A stream cipher is any sort of encryption which adds letters to a message in order to prevent it being read by a person other than the intended recipient. The letters added become the key to both encryption and successful decryption, and as the key is as long as the message it can be fairly expensive to implement such a system securely.

I developed a modification to the stream cipher, which incorporates “merging” the message into itself in a nice way in addition to the standard stream cipher encryption. The final result is much more resistant to a partial-knowledge attack on the message and so weaker keys may be used to achieve equivalent security. I will discuss how the cipher works, and the security results I obtained after implementing and testing the system.

## **The Realities of Reclamation in the Jonah Field**

Mae Peterson with Dr. Peter Stahl

Department of Renewable Resources

University of Wyoming

Oral Presentation

*UW Honors Program*

*Pinedale, WY*

Remediation of environmental impacts of energy resource extraction has been recognized as a critical part of the natural resource development process. Improved natural gas extraction technologies have allowed for economical development of the highly productive Jonah natural gas field in Southwestern Wyoming. Reclamation of disturbance is required as part of the permitting process and must be successfully implemented to continue the productivity and function of the rangeland resource. Several agencies regulate the type and amount of disturbance as well as reclamation requirements. Because of the new activity and fast-paced development, little is known regarding best reclamation practices and few studies have been conducted to provide new information.

Growing conditions in the Jonah field environment are difficult and harsh which lead to challenges in vegetation community reestablishment and sustainability. Environmental conditions inhibiting a simple, quick and efficient reclamation process are presented. Some of these include: climate, water, soil and vegetation. Also discussed are both customary and innovative reclamation methodologies as well as techniques designed to avoid or minimize impact and need for subsequent reclamation. A more complete inventory and discussion of the biotic and abiotic limitations provide opportunity to tailor specific reclamation plans to the unique environment represented in the Jonah Field.

## **The Production and Modeling of Phonological Vowel Length Differences in Hungarian-Speaking Children and Their Caregivers**

Stacey Powell with Dr. Krisztina Zajdó

Communication Disorders

University of Wyoming

Oral Presentation

*NSF EPSCoR*

*Laramie, WY*

Language-specific speech timing is essential for producing intelligible speech. Therefore, learning adult-like speech patterns with language specific segment durations is important for children. Understanding the relationship between speech timing characteristics of children and their adult models may allow us to formulate evidence-based treatment approaches for clinical populations with atypical speech timing patterns.

The purpose of this project was to examine the production of vowel duration patterns in a group of 50 Hungarian-speaking children ages 2;0 to 4;0 years old. Participants produced tokens containing vowels with either short or long duration in bi-syllabic words /pi:pɪ:/ and /pi:pɪ:/.

Results suggest that children as young as 2;0 years old differentiate short vs. long vowel durations reliably. Independent of syllable position and stress pattern, phonologically long vowels at 4;0 years are not significantly longer than in younger age groups. In contrast, older children produce significantly shorter vowel durations in both syllable positions. These results indicate that it is challenging for children to control speech motor coordination when segment durations are shorter. To facilitate speech timing development in their children, mothers manipulate both short and long vowel durations while modeling speech. Clinical implications for the treatment of speech disordered populations will be discussed.

## **The Effect of Parental Literacy Experiences on a Child's Literacy Practices**

Charli Raben and Dr. Deb Parkinson

Family and Consumer Sciences and Early Childhood Education Departments

University of Wyoming

Poster Presentation

*McNair Scholars Program*

*Torrington, WY*

This study will examine the effects that the early literacy experiences of parents in Laramie, Wyoming have upon their preschool-aged children's literacy practices. I propose that children whose parents had positive early experiences with literacy will exhibit positive literacy practices more frequently than children whose parents had less positive experiences with early literacy. These literacy practices include understanding what a book is and how it works, the frequent use and proper handling of books and print materials, active listening and participation in stories, and the ability to retell a story in a book-like manner. To determine the correlation between parent and child literacy practices, parents will be asked to individually detail their literacy experiences in a survey or interview. Each set of parents will then be interviewed jointly about how they integrate their individual experiences to promote and support their child's early literacy. Children will be observed in an early care setting to measure how frequently each child demonstrates positive literacy practices. If children are observed to demonstrate more frequent positive literacy practices in accord with positive parental literacy experiences, a general conclusion may be drawn that parents' positive experiences and influence may contribute to their child's positive literacy experiences.

## **Localization of the PilZ domain from the BcsA protein within *Escherichia coli***

Joseph M Reed with Dr. Mark Gomelsky

Department of Molecular Biology

University of Wyoming

Oral and Poster Presentation

*NSF EPSCoR*

*Omaha, NE*

Recently, cyclic dimeric guanosine monophosphate, c-di-GMP, was shown to function as a novel bacterial second messenger. High concentrations of c-di-GMP cause the formation of biofilm due to synthesis of adhesive surface organelles like pili and production of cellulose causing suppressed motility. In contrast, low c-di-GMP concentrations inhibited biofilm formation and improved motility. C-di-GMP affects virulence in several bacterial pathogens; however, how c-di-GMP affects virulence remains unknown. The Gomelsky lab identified two PilZ receptors, which bind c-di-GMP in *Escherichia coli*, BcsA and YcgR. YcgR is a soluble protein that the Gomelsky lab has recently shown to be localized in the periplasm. The other receptor is in the bacterial cellulose synthase, BcsA, which is a trans-membrane protein. The PilZ domain located on BcsA binds c-di-GMP. BcsA is woven into the cytoplasmic membrane and crosses from the cytoplasm to the periplasm and back many times. Some computational predictions suggest that the PilZ domain of BcsA is located in the cytoplasm, while others suggest that this domain is located in the periplasm. The purpose of this study was to examine whether the PilZ domain from the BcsA protein is located in the periplasm or the cytoplasm. This would provide important clues as to where c-di-GMP action takes place.

***Streptomyces spp. Isolation from Soil in Cheyenne Wyoming***

Brady Rehm and Landin Smith with Anne Wolff

Life Sciences Department

Laramie County Community College

Oral Presentation

*INBRE Program*

*Laramie County Community College*

*Cheyenne, WY*

As a group, we wanted to find out how abundant *Streptomyces spp.* are in a variety of different soils. We wondered if it was more prominent in soil that was richer in nutrients or contained fewer nutrients, if the soil was wet or dry. We collected a variety of samples from the green house, tree roots, horse stables, dirt roads, and the soccer field surrounding Laramie County Community College.

We took our twenty eight samples and streaked them onto Actinomycete Isolation Agar and let them incubate for 7 days. A week later we found that some agar plates were abundant in *Streptomyces spp.* while others were not as abundant. We attempted to isolate the *Streptomyces* from the original agar and attempted to rid the new agar of any unwanted contaminating bacteria. Some *Streptomyces spp.* were able to grow in isolation, while others were contaminated with various other bacteria. In conclusion, we had some plates which were very promising for *Streptomyces spp.* and others which were not so promising for the specific bacteria wanted. In the future we intend to further characterize the isolated *Streptomyces spp.*, and look for possible antibiotic production.

**The Selfish Meep: The Memetic Fitness of Religious Humor and Theological Liberalism in Internet Environments**

Dana Rinne with Dr. Richard Machalek

Sociology

University of Wyoming

Oral Presentation

*UW Honors Program*

*Cody, WY*

Units of cultural information ("memes") may be analogous to units of biological information (genes) in that both, rather independently of the organisms that host and transmit them, may be differentially predisposed to survive in different kinds of environments. Religious memes and Internet environments are of particular interest in a world of rapid changes and developments in both religion and technology. It is argued that two kinds of religious memes may be especially apt to survive online: first, humorous, although potentially distasteful, memes, including satire and cartoons; and second, memes associated with "liberal" theology, or at least dissociated from religious fundamentalism. The "liberty" to transmit and receive potentially offensive memes is, of course, distinct from the various social and theological liberties associated with "liberal" religion. It is argued, therefore, that although some degree of "memetic regulation" may be helpful in promoting online reverence and respect for religious narratives, any regulatory efforts would need to be tempered by an appropriate degree of respect for individual autonomy and choice.

## **Experimental Investigation of Swirling Jet Growth Rate and Wall Shear Stress**

Bryon Riotto with Dr. Jonathan W. Naughton

Mechanical Engineering

University of Wyoming

Oral Presentation

*NSF EPSCoR*

*Wilson, WY*

Two separate studies are examined: determining the growth rate of a swirling jet, and measuring the skin friction coefficient. The growth rate of a free jet is known to be a function of swirl number. It is also known that at low swirl numbers the growth rate is relatively unaffected, and at high swirl numbers the growth rate becomes saturated. However, the points at which these phenomena occur are not well known. Planar Laser Mie Scattering (PLMS) was used in this study to determine the growth rate of a swirling jet over a wide range of swirl numbers. Two different swirl profiles at two Reynolds numbers were examined.

The skin friction coefficient ( $C_f$ ) is essential to determining the friction drag over a surface. While it is known how to measure  $C_f$  over a smooth surface using Oil Film Interferometry (OFI), there are extreme difficulties in determining this quantity over a rough surface. "The momentum integral method" with Laser Doppler Anemometry (LDA) is a method for determining  $C_f$  over a rough surface. In order to determine the validity of this method, it is first tested over a smooth surface and checked against the results of OFI measurements. The preliminary results of the OFI measurements are presented.

## **Protein Digestion by Microwave-Assisted Acid Hydrolysis**

Megan Roberts with Dr. Franco Basile

Department of Microbiology

University of Wyoming

Oral Presentation

*NSF EPSCoR and UW Honors Program*

*Lander, WY*

Microwave-Assisted Acid Hydrolysis is one of several methods being developed by which bacteria can be identified based on the unique proteins they carry. This method combines the use of formic acid and microwave heating in order to cleave proteins at specific locations. Unlike the use of enzymes which often takes several hours, this method can be carried out in a matter of only 5 minutes. After the proteins have been digested into smaller fragments, mass spectrometry can then be used to identify the protein. This rapid analysis would be invaluable for bacteria identification in the field. The goal for this project was to optimize the acid and heating conditions.

Lysozyme (Sigma) protein solutions were prepared with 2%, 4%, 6%, and 10% formic acid. These samples were microwave heated with a Microwave Hydrolysis/Reactor (CEM Corporation) for 5 minutes. The proteins were then analyzed on MALDI-MS (Voyager DE-PRO, Applied Biosystems). The peptide GRGDSP (Ana Spec, Inc.) was analyzed in the same manner. For the peptides digested using this method, site specific cleavage was observed at aspartic acid, specifically at the N-terminus. Although C-terminus cleavage was also observed, it was not the predominant digestion product. Proteins were also digested using this method with limited results. In the case of the protein lysozyme, only one cleavage peak was observed for the 6% formic acid sample.

## **Bond Strength of AAC Thin-bed Mortar and AAC Grout-Interface**

Tyler Robison with Dr. Jennifer Tanner  
Civil and Architectural Engineering  
University of Wyoming  
Oral Presentation

NSF EPSCoR

Fort Collins, CO

Autoclaved aerated concrete (AAC) has many advantages as a new and innovative building material introduced to building construction. It is lightweight, has a high fire rating, and excellent acoustical properties. Typical AAC applications include floor and roof diaphragms, and shear walls.

Bond strength between thin-bed mortar and AAC units is important to the structural performance of AAC buildings. In an AAC floor diaphragm lateral loads may be transferred from the diaphragm to a shear wall through adhesion between a grouted bond beam and the floor slab.

These specimens were tested to expand the scope of tests related to bond strength in the current masonry code. There are two tests that were conducted on typical AAC specimens. The first was the direct shear test, which evaluated specimens that simulate the loading conditions of the grouted bond beam/floor slab connection. An additive called methylcellulose was used to investigate the effects of it on the strength of the bonds. The specimens were built under different humidity levels to simulate different regions of the country. Bond wrench tests were performed to investigate the flexural tensile strength of thin-bed mortar joints.

## **Utilizing *Caenorhabditis elegans*, an invertebrate model system, to study innate immunity**

Katherine Rogers with Dr. David Fay  
Department of Molecular Biology  
University of Wyoming  
Oral Presentation

NSF EPSCoR

Rock Springs, WY

To date, the study of immunology has relied heavily on mammalian model systems. Invertebrate systems offer several advantages over mammalian systems; specifically, invertebrate systems are amenable to large-scale genetic screens that could lead to the identification and characterization of novel components of the immune response. Recent research suggests that the nematode *Caenorhabditis elegans* may be an ideal model for the study of innate immunity; several groups have used this system to identify bacterial virulence factors as well as host factors involved in immunity. These results demonstrate the potential of this system as a genetically tractable disease model.

Recent research has revealed a role for *fshr-1*, a *C. elegans* G-protein coupled receptor, in innate immunity. To further dissect the role of *fshr-1* in innate immunity and, additionally, to identify novel genes involved in the immune response, we carried out several mutagenesis screens. We have identified two mutations, *sfr-2* and *sfr-6*, that interact synthetically with *fshr-1*. Specifically, knockdown of *fshr-1* in the presence of *sfr-2* or *sfr-6* renders animals susceptible to infection by a normally benign strain of *E. coli*. We are currently mapping these mutations, which could represent novel genes involved in innate immunity.

## **Spider Silk Expression in Alfalfa**

Monica Rowan with Dr. Randy Lewis & Dr. Holly Steinkraus- Molecular Biology, Dr. Robin Goose- Plant Sciences  
Molecular Biology and Plant Sciences  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Edinburg, TX*

Over the last several years, comprehensive research has been done at the University of Wyoming (UW) to enhance our knowledge of spider silk. Spider silk is one of nature's oldest biomaterials and has long been revered for its strength and flexibility. The researchers at UW have been working on a system that incorporates spider silk genes into alfalfa plants. The research goal is to produce an alfalfa plant capable of expressing spider silk proteins. The spider silk proteins could then be extracted to create spider silk fibers. Once these transformed plants are produced, a means of mass producing spider silk fibers could be on the horizon. From these fibers many things can be constructed. Some proposals encompass biomedical uses which include sutures, artificial tendon and ligaments; industrial uses include protective clothing, composite materials for building and aerospace applications.

## **Title 1 Database**

Anthony Russo  
Management of Information Systems  
University of Wyoming  
Oral Presentation

The purpose of this research is to design and develop a system that will keep the records of all students at the Wyoming Boys' School. Currently in place is a spreadsheet that keeps the information, but it is difficult to manipulate that data for Department of Education reports.

The Wyoming Boys' School houses 60-80 students at a time for as little as 3 months to as long as 2 years or more. It is very difficult to keep records of these students and to be able to manipulate those records for department of Education reports is even more difficult and very time consuming. This database is going to ease that burden.

# **Effect of nuclear factor kappa-B inhibition on Alzheimer's Disease-evoked neuroinflammatory response in a transgenic mouse model**

Kyle Ryff with Dr. Bruce Culver

Pharmacy

University of Wyoming

Poster Presentation

*NSF EPSCoR*

*Laramie, WY*

The purpose of my study for the spring semester of 2008 was to evaluate the inflammatory response in my transgenic AD mouse model and explore the possible effects of PDTC, a NFkappaB inhibitor on AD evoked neuroinflammation. NFkappa-B has been shown to be translocated to the nucleus in neurons expressing cyclo-oxygenase-2 (COX-2) after brain ischaemia (inflammation) (Antti, 2004). Antti showed that mouse models lacking the expression of pro-inflammatory genes, such as COX-2, showed reduced brain ischaemia (Antti, 2004). PDTC is an established antioxidant and NFkappa-B inhibitor (Schreck, 1992). I was looking to see if PDTC injected into the abdomen would cross the blood-brain barrier and reduce expression of COX-2 and NFkappa-B.

To determine whether PDTC treatment had an anti-inflammatory effect on our AD treated mice (APPswe/PS1dE9 mice), we assessed astrogliosis using GFAP marker. Astrocytes and other glial cells were stained using anti-GFAP antibody. Micrographs from these immunohistochemistry tests revealed an increase in the number of GFAP positive cells. The western blot results showed significantly elevated protein levels of GFAP in untreated APPswe/PS1dE9 mice as compared to the wild type animals. After PDTC treatment, the GFAP levels marked diminished in APPswe/PS1dE9 mice. This suggests that PDTC treatment attenuate reactive astrogliosis in transgenic AD mice.

It was also apparent that the long term PDTC treatment abolished COX-2 induction in the APPswe/PS1dE9 mice. Hippocampal and cortical COX-2 protein expression were measured by western blot. The levels of COX-2 protein were significantly increased in untreated APPswe/PS1dE9 mice as compared to the wild type animals (\*\*, p<0.01). PDTC treatment abolished COX-2 induction in the transgenic mice (##, p<0.01 compared to untreated APPswe/PS1dE9 mice).

Behavior tests performed by the mice also supported our results. An open field test, radial-arm maze, and Morris water maze were conducted. Each behavior test was performed by our positive mice treated with PDTC and negative control mice for comparison. The data showed similar results between the positive treated mice and the negative control mice giving the assumption that the treatment had positive effects on the mice.

During sacrificing of the mice to retrieve the brain, organs were also weighed. The kidneys, liver, heart, and brain were collected and weighed from each of the positive treated mice and negative controls. All had similar masses which showed that the PDTC didn't have effects on the other organs. Shrinkage of the organs would have had a major impact on the data and would have been discarded.

## **Satellite remote sensing technology for identifying variability in sugar beet growth**

Vince Salerno with Dr. Ramesh Sivanpillai

Department of Renewable Resources

University of Wyoming

Oral Presentation

*WyomingView*

*Clarkfork, ID*

Monitoring crop growth in agricultural fields with ground surveys is often expensive and it is difficult to delineate areas based on variability in growth. However, for growers to ensure optimal productivity of their land, monitoring is necessary to determine proper location of necessary treatment(s).

Satellite-based remote sensing imagery has been shown to provide information for monitoring crop growth and can reduce the need for frequent ground surveys in large agricultural fields. To evaluate the potential of satellite images for monitoring crop growth in small farm holdings that are typical to Wyoming, we used Landsat Thematic Mapper data acquired in 2006 and 2007 from WyomingView (a USGS funded program at UW). Areas of poor, average, and high crop growth within these fields were identified using digital image processing techniques. A composite map showing trends in growth was generated, and will be compared to previous soil treatments for determining the effectiveness of those treatments. Further areas that would benefit from additional treatment will be identified. Landsat derived information can be used for improving crop yield by optimizing nutrient inputs which will be beneficial to the economy and environment.

## **Aiding the Disabled**

Lori Sandberg with Dr. Steve Barrett

Mechanical Engineering

University of Wyoming

Poster Presentation

*NSF EPSCoR*

*Albin, WY*

Engineering is a department with a goal of helping people and their needs. Student researchers worked closely with Dr. Steve Barrett who helps with projects for the “Undergraduate Projects to Aid Wyoming Persons with Disabilities” research program which is sponsored by the National Science Foundation. The researchers specifically worked on a power-assisted trike for two handicap children in Wyoming. The trike was designed to allow the children to strengthen their leg muscles by pushing the foot pedals.

This project, which was originally started as one of UW College of Engineering senior design project, needed more work done to it. The electronics needed to be better insulated from outdoor obstacles like water and mud. Waterproofing methods were researched and used to help keep the electronics dry. For instance, weather stripping was used around the edges of the box where the electronics were kept to help keep them dry. An engineering program, Solid Works, was used to design splash guards that could put around the wheels to help prevent water and mud from splashing up on the electronics and the child. The trike is closer to being ready for the children to use.

## **GIS in Search and Rescue**

Michelle Sanecki

Geographical Information Systems

Casper College

Oral Presentation

*Casper, WY*

Research to be addressed is the issue of using GIS software and GPS tracking systems for search and rescue planning and implementation. At issue is whether searches can be made more efficient and better documented using the GIS software. The idea is that the computerized data could be used to effectively plot the completed search patterns and pinpoint exact areas for searchers to concentrate.

Search and rescue is an important resource in helping to find people, whether lost hikers, children or adults who have been abducted, or victims of accidents or natural disasters. Complete and accurate records are extremely important, both for the progress of the search itself, as well as for documentation of the search procedures.

The Incident Commander in charge of a search and rescue operation must make fast and accurate decisions based on the data at hand. He or she would currently rely on verbal reports of searchers using maps to walk a specific search pattern. The purpose of this paper is to demonstrate the need to incorporate new technology into search and rescue procedures to make teams faster and more accurate, and give a specific example of how that technology can be used.

## **Molecular Hydrogen Production using Purple Non-sulfur Bacteria Enriched from Anaerobic Digester Sludge**

Matthew J. Scarborough with Dr. David M. Bagley

Civil and Architectural Engineering

University of Wyoming

Oral Presentation

*NSF EPSCoR*

*Evans City, PA*

Due to increasing fuel prices and growing concerns of global warming, alternative energy sources need to be investigated. One such source is the harvesting of energy through the combustion of hydrogen gas. Current means of producing hydrogen gas are expensive. An alternative, and possibly less expensive, method to produce hydrogen gas is through biological processes.

Anaerobic digester sludge from Cheyenne's Dry Creek Water Reclamation Facility was enriched for purple non-sulfur bacteria (PNSB). Enriched PNSB were then used to produce molecular hydrogen (a) with artificial lighting at constant temperature; and (b) with natural lighting and temperature. For both experiments, the PNSB were fed a mixture of butyric and acetic acids.

With controlled temperature and lighting indoors, the PNSB produced a maximum of 22.7% of the theoretical amount of molecular hydrogen that could have been produced. Outdoors, on top of the Physical Sciences building at the University of Wyoming, the PNSB produced a maximum of 0.72% of the theoretical amount of molecular hydrogen that could have been produced.

## **Microjet Shear Stress**

Bridget Schabron with Dr. Jon Naughton  
Mechanical Engineering  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Laramie, WY*

The presentation to be made is on the experimental study of a supersonic impinging microjet that was conducted to measure wall shear stress. The method of oil film interferometry was used to measure the shear stress. Measurements were made for various height to diameter nozzle ratios and nozzle pressure ratios.

In contrast to a previous study, the plate temperature for this study was monitored vigilantly, and the camera calibration was carefully carried out in order to obtain more accurate wall shear stress results. The monitoring of temperature was especially important, as the variance of temperature affects the actual oil viscosity. Grids were used to calibrate the camera images before the analysis, in order to assure that the perspective of the lens did not affect the results.

The results of the study indicate that wall shear stress rapidly decreases as the distance from the impingement point increases. The study of wall shear stress created by microjets is important due to its present use in clean rooms and for spot cooling, more specifically the cooling of parts on small parts and electronics.

## **Constraining Galaxy Evolution via Hydrogen Line Emission Luminosity Functions**

Micah Schuster with Dr. Daniel Dale  
Physics and Astronomy  
University of Wyoming  
Poster Presentation

*Wyoming NASA Space Grant Consortium*

*Lander, WY*

A galaxy's star formation rate is one of its fundamental properties. The number of stars forming per year within a galaxy tells us how quickly stellar mass is being built up, and the rate at which star-forming material such as molecular clouds is being used up. It is interesting by itself to measure the star formation rate within a single galaxy. However, measuring the star formation rate for large ensembles of galaxies, spread across multiple epochs in the history of the Universe tells us something even more profound: the average evolution of star-forming galaxies as a function of cosmic time. I propose to spend much of my summer months learning how to carry out narrowband optical imaging on the University of Wyoming 2.3 m telescope, and how to 'process' the data into a useable format. During the 2007-2008 academic year I plan to analyze the imaging data taken during the summer. My ultimate goal is to fit theoretical models to the luminosity distributions observed at each epoch, which will directly lead to a constraint on the evolution of star-forming galaxies with time.

**Fingerprinting *Thomomys clusius***  
Mat Seymour and Dr. Dave McDonald  
Zoology Department  
University of Wyoming  
Oral Presentation

NSF EPSCoR

Schuyler Falls, NY

The Wyoming pocket gopher (*Thomomys clusius*) is the only vertebrate species occurring exclusively in Wyoming. Sympatric with northern pocket gophers (*Thomomys talpoides*), *T. clusius* inhabits a much smaller range and differs in chromosome number. With increased natural resource extraction, and limited existing research, concern has grown regarding the Wyoming pocket gopher's status. Gophers were trapped during the summer and fall across the historic range of *T. clusius*. Individuals caught were, however, morphologically more similar to *T. t. ocius* than to *T. clusius*. We used 367 (AFLP) markers to examine genetic variation in fifteen subspecies of *T. talpoides* throughout the Rocky Mountain region, including gophers captured in Southern Wyoming. Although previous studies based on mitochondrial and nuclear DNA revealed incomplete lineage sorting (poor resolution of phylogenetic differences) among species in the genus *Thomomys*, individuals from designated subspecies clustered monophyletically in our analyses (good phylogenetic resolution). Gophers captured in the historic range of *T. clusius* formed a monophyletic group most closely related to geographically the nearest subspecies of *T. talpoides*. These findings further suggest gophers captured in Wyoming were subspecies of *T. talpoides* and *T. clusius* is rare. Future work will include karyotype analysis of live trapped gophers, and DNA sequencing of short nuclear amplicons from 35 *T. clusius* museum along with other subspecies of *T. talpoides* in the hopes of identifying and characterizing genetic divergence in this potentially endangered pocket gopher.

**The Dark Saint: Reinventing Unamuno's  
*San Manuel bueno, martir***  
William Sircin with Dr. Carlos Mellizo  
Modern and Classical Languages  
University of Wyoming  
Oral Presentation

The presentation focuses on Calos Mellizo's short story "Párroco de Valverde," a retelling of Miguel de Unamuno's 1930 novella *San Manuel bueno, martir*. Specifically, it examines the ways in which Mellizo reimagines and fleshes out the novel's protagonist, don Manuel, a priest in a fictional Spanish village. Unamuno's version of the character is an individual who, although constantly tortured by his secret lack of faith in God and the afterlife, dedicates himself to ensuring the well-being of his parishioners and their belief in "the rewards of Heaven." As a result, he becomes a martyr and a saint.

However, in creating this impossibly altruistic portrait, Unamuno leaves many questions unanswered, and it is Mellizo's goal to explore the (often sordid) possibilities that those mysteries offer. What, for example, is the true nature of don Manuel's relationship with the novel's young narrator, Angela? Why does Lázaro, Angela's staunchly atheistic brother, collaborate so willingly with don Manuel after learning his secret? And, most importantly, what secret motivations lie behind Manuel's decision to hide his lack of faith? In answering these questions, Mellizo creates a much more cynical, sinister and selfish—in other words, more human—incarnation of don Manuel.

## **Application of Spider Silk for Tissue Engineering**

Christina Skinner with Dr. Patrick Johnson  
Chemical and Petroleum Engineering  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Cody, WY*

The increasing number of tissue failures and repairs, coupled with a lack of adequate replacement options, has prompted the need to explore alternative methods for treatment of tissue degeneration. Tissue engineering is emerging as a significant clinical option to address tissue and organ failure by implanting biological substitutes for the affected tissues. Recent studies have prompted researchers to look into the possibility of using spider silk as the basis material for tissue engineering. Spider silk has many unique mechanical properties such as superior energy absorbance, elongation, and tensile strength. It is also highly clinically compatible with a list of given relevant requirements such as minimal patient morbidity, deeming it potentially successful for implementation.

The initial focus of this project was the surface analysis of films made from native, recombinant, and goat milk silk protein. This surface analysis included both AFM and contact angle studies. Cell response studies were conducted to assess cell attachment, morphology and proliferation between the three types of silk films. Future studies will include a look at nerve and cardiac tissue repair using spider silk protein as a biocompatible scaffold. If current and future studies prove successful, the use of spider silk in tissue reconstruction could become a powerful alternative to current methods.

## **The Contraceptive That Works Too Well: Effect on the Pituitary**

**Gland of Chronically Administering Deslorelin**  
Arik Smith with Dr. Donal Skinner  
Zoology and Physiology  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Casper, WY*

Healthy captive animal populations require reproductive management. Previous drugs, however, designed to control reproduction have demonstrated problems in efficacy, ease of use, and cost effectiveness. In contrast, development of a new agent deslorelin, abbreviated DESL, shows promise. When administered in a pulsatile fashion, DESL causes the pituitary gland to release hormones that stimulate testes and ovaries; daily administration inhibits reproductive function.

Although advances in the use of DESL for control of reproduction are evident, post-treatment infertility in some animals treated with DESL warrants more research. We are examining at the cellular level why infertility occurs in certain animals treated with DESL.

## **Lost in Translation: Hayao Miyazaki's Films through the Disney Machine**

Sarah Smith with Dr. Susan Aronstein

English Department

University of Wyoming

Oral Presentation

*UW Honors Program*

*Ashburn, VA*

Research to be addressed involves Japanese animation director Hayao Miyazaki and four films produced by his company, Studio Ghibli. These films are “Nausicaa of the Valley of the Wind,” “Princess Mononoke,” “Spirited Away,” and “Howl’s Moving Castle.” His films feature strong female characters that face incredible odds to restore right in their worlds. These films are based upon Japanese history and traditions, environmental concerns, and the destruction of humanity.

These films are very popular in Japan and the Walt Disney Company decided to purchase the rights to the films and release them in America. Their success grew slowly and although Miyazaki is not a household name, he is gradually becoming very well known.

While Disney’s distribution of these films allows more people to access them, there is something missing from our Western interpretations of the films. America is a country that is largely based on Disney’s fairy tales and we have become accustomed to certain plot devices and characters. Miyazaki’s films reject these standards. This paper will attempt to analyze the cultural aspects of Miyazaki’s films and what American audiences lose when they interpret it through Disney expectations.

## **Enhanced Tunneling Magnetoresistance and High-Spin Polarization at Room Temperature in a Teflon-Coated Fe<sub>3</sub>O<sub>4</sub> Granular System**

Teri Sones with Dr. Jinke Tang

Department of Physics and Astronomy

University of Wyoming

Poster Presentation

*McNair Scholars*

*Laramie, WY*

Ferrimagnetic magnetite (Fe<sub>3</sub>O<sub>4</sub>) has a theoretical fully spin-polarized conduction band. This study will investigate the issues that can lead to a highly spin-polarized electron current across a Teflon/ Fe<sub>3</sub>O<sub>4</sub> interface and the effects of coatings on the oxidation and spin-polarization of this surface. Normally, the surface of Fe<sub>3</sub>O<sub>4</sub> is oxidized, which is believed to be the main cause for previous failures to observe high spin polarization in Fe<sub>3</sub>O<sub>4</sub>. We propose the addition of Teflon to the nanoparticles to dramatically reduce the instances of oxidation and increase spin polarization. Teflon and  $\alpha$ -Fe<sub>3</sub>O<sub>4</sub> nanoparticles will be combined by adding them to a solvent, mixing, and then evaporating the solvent. The samples will be annealed at high temperatures in pure hydrogen flow, and then pressed into pellets. The pellets will again be annealed in pure hydrogen flow. The structural analysis will be done by x-ray diffraction (XRD) and transmission electron microscopy (TEM). The transport properties of the samples will be measured using the four-point method and in ac mode. Both the transport and magnetic measurements will be performed with a physical property measurement system (PPMS). If 100% spin polarization is achieved, this would have relevance in the advancement magnetic random access memory and magnetic read head technologies.

**Passion of Place:  
Nature Writing as Living Landscapes**  
Ann Stebner with Dr. Robert Torry  
English  
University of Wyoming  
Oral Presentation

*UW Honors Program  
& English Honors*

*Rawlins, WY*

Research will examine the literary genre of nature writing and will be used to craft two creative essays that work within and against this genre. A brief essay will accompany the two creative pieces and it will provide reflection on the place of my work in the context of the nature writing genre.

My essays will examine nature writing, an often overlooked genre in literary criticism. I posit that it explores issues that are deeply important to the understanding of areas of human experience as diverse as sexuality, spirituality, politics, family, race, and class. Many authors have influenced my work, and I will focus on authors such as Terry Tempest Williams and Edward Abbey. These influential figures write with grace and passion about landscapes that have formed their understandings of the world.

While attempts have been made to cast Williams as the female counterpoint to Abbey's masculine voice, I believe that these categorizations are too easy and too simplistic. I believe my works contain elements of both feminine and masculine voice. This project is an attempt to mine the opportunities offered by the nature writing genre to examine the construction of cultural understandings about people and place.

**Looking Back and Moving Forward:  
The 2004 Tsunamis and their Impact on 21<sup>st</sup> Century South India**  
Sheanna Steingass with Dr. Leah Hardy  
Agriculture  
University of Wyoming  
Oral Presentation

*UW Honors Program*

*Sheridan, WY*

This presentation will examine the events surrounding the 2004 Indonesian tsunamis and how they affected South India (namely the state of Tamil Nadu). This presentation will explain the initial events surrounding the tsunamis, the damage caused by them, and how the community reacted.

South India is a dynamic area that is both highly influenced by emerging technology, as well as rooted in traditional values, beliefs, and economic consequences. The 2004 tsunamis played an important part in realization of this, and due to the unique culture of the area, rebuilding of these communities has been handled in various ways. We will explore the cultural history of these areas, and use this information to explore the current socio-economic situation of South India. We will also cover the unique geological characteristics of the region that caused these events to occur, and how preventative measures will be taken to prevent another comparable disaster in the future.

## **Gonadotropin Releasing Hormone Receptor mRNA Expression in the Murine Cerebellum**

Heather Talbott with Dr. Donal Skinner

Department of Zoology and Physiology

University of Wyoming

Oral and poster presentations

*NSF EPSCoR*

*Rock Springs, WY*

Reproduction is driven by gonadotropin releasing hormone, GnRH, which is released from the hypothalamus and stimulates the release of FSH (follicle stimulating hormone) and LH (luteinizing hormone) from the anterior pituitary. Immunohistochemistry and western blot analysis in mice provides some evidence that the GnRH protein exists within some cells of the cerebellum. To verify this evidence and provide further support for this discovery reverse transcriptase-polymerase chain reaction (RT-PCR) was performed to determine if the mRNA coding for the GnRH receptor is present in the murine cerebellum. Results show a very low concentration of GnRH receptor mRNA. This could be due to degradation of the RNA, or it is possible that each strand of RNA is used multiple times to produce many of the GnRH receptor proteins. This has implications in some reproductive diseases, most notably Gordon Holmes syndrome, characterized by reproductive incompetence and cerebellar ataxia. A defect in the GnRH receptor could possibly have drastic influences on cells involved with movement and coordination within the cerebellum. Further investigation of the influence of GnRH on the cerebellum would be needed to help provide the link between the symptoms of Gordon Holmes disease.

## **Effects of Deslorelin on Murine Cardiac Tissue**

Heather Talbott with Dr. Donal Skinner

Department of Zoology and Physiology

University of Wyoming

Poster presentation

*McNair Scholars Program*

*Rock Springs, WY*

Prostate cancer, a problem for some men is sometimes treated with a gondotropin releasing hormone (GnRH) agonist, such as deslorelin. GnRH agonists work by desensitizing GnRH receptors and reducing levels of many reproductive hormones. Testosterone, one hormone regulated by GnRH, has been implicated in fueling prostate cancer growth, and reduction of testosterone levels by GnRH agonists is a treatment for prostate cancer. There are some problems associated with this treatment; a recent study reported cardiac events occurred at a higher rate for men taking GnRH agonists compared to other treatments. In this study we will examine the effects of deslorelin on murine cardiac tissue. We will use reverse transcriptase PCR to examine GnRH and GnRH receptor mRNA levels in male mice that have been administered deslorelin. Immunohistochemistry will also be used to visualize cells in the cardiac tissue that produce and are affected by GnRH. We believe that the murine heart has its own GnRH system independent from the GnRH axis present in the brain, and that GnRH agonists have significant negative effects on the heart. This has significant importance in the treatment of prostate cancer with GnRH agonists, especially to men with increased risk of cardiac problems.

## **Investigating Lateral Migration of a Falling Micro-Droplet on a Striped Surface**

Dane Taylor with Dr. David R. Thayer

Department of Physics  
University of Wyoming  
Oral Presentation

*Wyoming NASA Space Grant / UW Honors Program*

*Laramie, WY*

Droplet actuation and manipulation is currently a major area of research in digital microfluidics, which has vast applications in the biomedical, self-assembly, opto-fluidic, and materials fields. This project presents a new phenomenon in micro-scale droplet motion by taking advantage of asymmetric contact line hysteresis. A surface with angled stripes of different wetting properties is used to influence lateral motion of a falling drop. Designing lateral droplet motion may be used to improve de-wetting through the promotion droplet mixing, and may also provide an alternative approach to droplet actuation in “lab on chip” devices. Using the Lattice Boltzmann Method (LBM), simulations of a falling droplet on such a surface are being developed to test this phenomenon.

## **Ancestral Sequence Reconstruction and Homology Modeling of Deoxyribonucleoside Kinase (dNK)**

Chandra Thompson with Dr. David Liberles  
Molecular Biology  
University of Wyoming  
Oral Presentation

*NSF EPSCoR and UW Honors Program*

*Conifer, CO*

Gene duplications are important in the evolution of genes and genomes because with gene duplication, proteins can evolve new functions. The dNK enzyme catalyzes the phosphorylation of dNs to dNMPs in the salvage pathway of deoxyribonucleosides essential for obtaining DNA precursors. Chordates have four forms of the enzyme TK2, dCK, and dGK specific for certain substrates. Arthropods have only one form of the enzyme dNK that can bind and phosphorylate all substrates.

Based on phylogenetic analysis it appears that the dNK ancestor of chordates and arthropods is more similar to TK2-like enzymes than dNK. The hypothesis is that the dNK ancestor had greater substrate specificity and through neofunctionalization coupled to gene loss events dNK evolved broader specificity along the insect lineage.

Ancestral sequences for dNK were created using ideal topologies from the Ecdysozoa and Coelomata hypotheses of species relationships. The sequences were then modeled to give a 3D structure. The energies for binding sites and the overall enzyme were analyzed for each hypothesis and other dNKs. The analysis of these energies indicates that Ecdysozoa is a more thermodynamically stable model, more likely phylogenetically, and that Coelomata and Ecdysozoa may have binding specificity that is more similar to TK2 than dNK.

## **Optimization and Characterization of Protein Nanoparticle Size**

Sean M. Ukele with Dr. Patrick A. Johnson  
Chemical Engineering  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Casper, WY*

The idea of a renewable biological fuel source is by no means new with research dating back to the early electrochemistry days. However, the ever-growing demand for petroleum-based energy and the declining number of discovered sources has recently directed a large focus on alternate and renewable energy sources such as bio-fuels.

Nanostructured materials have also been growing in interest due to their unique qualities including very large surface areas and ease of isolation. Enzymes cross-linked to form protein nanoparticles offer a variety of solutions to the problems currently encountered in enzyme fuel cell research including: maintenance of enzyme activity, low electrode loading capabilities, isolation, and no introduced transport issues.

For this study protein nanoparticles composed of Albumin were produced by cross-linking the protein molecules. The nanoparticles were characterized based on constituents and size as a base model for future work with enzymatic nanoparticles. The effective diameters of particles produced were obtained through the use of phase analysis light scattering methods. The project is now in the early stages of testing enzymatic fuel cells that incorporate the cross-linked nanoparticles modeled.

## **Pink & Perfect: Probing Internet Royalty Jeffree Star**

Grant Walsh-Haines with Dr. Jessica Bryski  
Women's Studies Program  
University of Wyoming  
Oral Presentation

*UW Honors Program*

*Cody, WY*

This paper is an exploration of Jeffree Star. Jeffree Star is homosexual, a cross-dresser and thereby transcends traditional gender norms. Jeffree Star is also controversial in other ways, including the use of obscenity, perverse and disturbing imagery, and provocative opinions. All of these trends, emphasized on his various Internet artifices, pique the interest of gender and women's studies.

Through researching a variety of textual support and observing various images and internet representations of Jeffree Star, there are several important themes that reoccur. These themes include: trans-identity; self-obsession and self-loathing; artificiality; and feminism. Important conclusions of this research will include Jeffree Star's direct and indirect impacts on feminism and queer culture.

The final draft of this paper will be formatted as a MySpace page, a tribute to the medium and contemporary multimedia by which Jeffree Star has become self-proclaimed, "internet royalty."

## **Outdoor Adventure Program Rental System**

David Wanjiru, Justin Barber and Ian Waweru

With Allyson Anderson

Management Information Systems

University of Wyoming

Oral and Demonstration Presentation

*Laramie, WY*

The OAP rental system will be a single point of control for the Outdoor Adventure Program. Currently the OAP staff and administrators use a combination of spreadsheets, flat text files, and databases with no front ends to achieve a minimum level of functionality and reporting capabilities. There are currently 15 different documents that are used to control the activities of the OAP. Inventory is at the moment in a very large excel workbook. The business rules are vague and only seem to be known to one person, the OAP manager. By providing a single source of OAP accountability and reporting the operational revenue of the OAP should be increased. The level of reliability of information should be greatly increased along with the staff's confidence in the information they provide OAP customers. The reporting functions provided by our implementation of the OAP rental system will attempt to address these serious problems and concerns.

We will present two versions of the system. The first is a Microsoft access only solution, the second is an asp.net and vb.net web accessible system. Both versions will be demoed. A PowerPoint presentation will be shown detailing the design lifecycle of the project and providing insight into the business rules of the outdoor adventure program and our implementation of the rental system.

## **A State in Need Is Wyoming Indeed**

Cole Weaver with Dr. Jane Nelson

Biology

University of Wyoming

Oral Presentation

*UW Honors Program*

*Casper, WY*

The research to be addressed is the need for dental health practitioners in Wyoming. It is important to quantify this need and investigate the proportion of these practitioners that serve lower income patients by accepting government healthcare programs. These are patients covered under Medicare, Medicaid and Title 19. It has been observed that there are a large number of dental health practitioners that do not accept these patients. The dentists that do, do so only in a very small number

Surveying general dentists throughout the state of Wyoming will make it possible to determine the number of dentists that are accepting or not accepting patients. An attempt will be made to determine the reasons for this, and how far ahead the patient schedule runs to quantify the shortage of coverage. The different forms of government healthcare accepted will also be addressed. The reasons why government healthcare is accepted, and in opposition, why the majority of dentists do not accept these forms of payment will also be determined. Programs such as WYDENT and WICHE have been instituted to combat the shortage in both areas. This project will examine the reasons these programs exist and justify the decision to utilize them.

## **The Commercialization of Nanotechnology**

D.J. Weekly with Dr. Christopher Rothfuss

Management and Marketing

University of Wyoming

Oral Presentation

*UW Honors Program*

*Cheyenne, WY*

Nanotechnology is a rapidly developing industry that will have a major affect on the way we live our lives. Creating new products with special properties on such a small scale poses ethical dilemmas, and quite often, fear in the eyes of the general public. When businesses are investing in nanotechnology, their products face the opposition of these and other social perspectives. Companies also face inherent nanotechnology challenges such as transforming the properties found on the nanoscale into the real world scale.

The research conducted in this paper will look at many different industries that are utilizing nanotechnology to create new products. It will also address the issues companies face in creating a product that is economically viable and ultimately, financially profitable. In addition, the processes that different companies use to transfer the concepts discovered from their research and development to a commercialized product, utilizing nanotechnology, will also be discussed.

## **Effectiveness of Trapper's Point Wildlife Crossing Animal Detection System**

William N. Winkler with Dr. Rhonda Young

Civil and Architectural Engineering

University of Wyoming

Oral Presentation

*NSF EPSCoR*

*North Pole, AK*

In Wyoming Animal-Vehicle collisions are a prominent problem. In fall 2005 an Active Wildlife Sensing Driver Warning System was installed at Trapper's Point Wyoming. This system uses both Geophones and Infrared Sensors to detect animals that are on or around the roadway. When an animal is detected the sensors activate a group of flashing driver warning signs that read,"DEER ON ROAD WHEN FLASHING." The effectiveness of these signs ability to slow driver's speeds is being measured through data collection.

Two trips were conducted in the fall of 2007 where data was collected. Wavetronics Smart Sensors are used to collect speed data. The effectiveness of the system in place at Trapper's Point is being measured through speed data collected. The speed data was analyzed using linear regression. Another measure of effectiveness for system in place is through crash data received through the Wyoming Department of Transportation. The number of crashes through the section of highway 191 has been collected for the year 2007. These numbers were then compared to the crash numbers from before 2005. The research that is being performed should conclude if the driver warning system is effective in warning drivers of animals near or on the roadway.

**The Isolation of Antibiotic-like Proteins from Insect Larvae of *Musca domestica*,  
Housefly Maggots, and Three Other Species of Insects**

Shana M. Wolff with Anne Wolff  
Life Sciences Department  
Laramie County Community College  
Oral and Poster Presentations

*INBRE Program*

*Laramie County Community College*

*Cheyenne, WY*

The purpose of this experiment was to examine the secretions from the larvae or maggots, of four species of insects for antimicrobial antibiotic production. I had observed fly larvae in dead animal flesh and hypothesized that insect larvae secrete antibiotic-like substances that kill bacteria in the dead tissue in which the insect larvae grow, protecting the insect larvae from bacterial attack.

In this study I used housefly maggots (*Musca domestica*), mealworm grubs (*Tenebrio*), fruit fly larvae (*Drosophila melanogaster*), and superworms (*Zophobas morio*). Fourteen different types of bacteria were streaked on agar plates. Secretions from the insect larvae cuticle were collected on sterile filter paper discs, placed on the inoculated Petri plates, and incubated. Zones of bacterial inhibition were observed and measured.

Results showed that housefly larvae, mealworm grubs, and fruit fly larvae secreted from their cuticle antibiotic-like substances that inhibited several species of soil bacteria. Further characterization using heat denaturation heat showed the secreted antibiotic-like substance to be a protein. These antibiotic-like proteins could possibly be of therapeutic value in the treatment of human infections as a new source of antibiotics.

**Culturally Mediated Self Evaluation Processes in the Prefrontal Cortex**

Everett Woodward with Dr. Daren Jackson and Nick Schwab  
Psychology  
University of Wyoming  
Oral Presentation

*NSF EPSCoR*

*Laramie, WY*

Cultural psychology continues to note culture's profound impact on the construction of self and how we respond to self-relevant information. However, to date there has been limited empirical work examining how cultural influences are encoded neurally. Attempting to better understand the neural representation of culturally mediated responding, the present study integrated work on approach and avoidance processes within the prefrontal cortex with cross-cultural work on self-evaluation. We hypothesized that American participants primed with American cultural icons would show greater cortical approach response (relative left PFC activity) to self-enhancing feedback and a greater cortical avoidance response (relative right PFC activity) to self-threatening information. Continuous electroencephalography (EEG) was recorded while American participants, primed either with American cultural icons or neutral icons, were told they performed either well or poorly on a creativity task. There was a trend for a main effect of feedback, with negative feedback resulting in greater relative right PFC activity. There was also a main effect for priming condition, with participants receiving an American prime showing greater relative right PFC activity regardless of feedback type. Finally, there was a significant interaction between priming condition and feedback, with culturally primed participants showing greater relative right PFC activity following negative feedback.

**Sagebrush Community Structure Characterization for Improved Remotely Sensed Imagery Use In the Laramie Basin, Wyoming**

Teal B. Wyckoff with Dr. Steven D. Prager and Dr. Kenneth L. Driese

Department of Geography  
University of Wyoming  
Oral Presentation

WSGC NASA

*Shawnee, PA*

The primary objective of the work completed during this project is to test our ability to model sagebrush cover across a density gradient using spectral reflectance and vegetation indices derived from the moderate resolution Landsat TM satellite imagery. The purpose of this work is to strengthen a scientific foundation for regional mapping of sagebrush structure. Such maps are desperately needed by habitat managers in the western U.S. and will also contribute to our understanding of these ecosystems in other contexts (e.g., carbon cycling, hydrology).

A vast sweep of sagebrush-dominated shrub steppe ecosystems occupies the Intermountain West of the U.S. The sagebrush landscape historically included over 600,000 km<sup>2</sup> in portions of all U.S. States west of the Great Plains, from New Mexico through the Dakotas and west to the Pacific Coast, but much of this area has been affected by human development and other disturbance.

Sagebrush steppe is globally important, influencing the carbon cycle, surface albedo, water dynamics and other earth surface-climate interactions. Sagebrush ecosystems provide habitat for many animals, including threatened species like the Greater sage grouse, pygmy rabbits, mountain plovers and white and black-tailed prairie dogs. It is also important for non-threatened species, like pronghorn antelope - icons of western wildlife.

**Fabrication of a Microfluidic Device Used for Separation of Biological Molecules**

Naoki Yanagisawa with Dr. Debashis Dutta  
Chemistry  
University of Wyoming  
Oral Presentation

NSF EPSCoR

*Yokohama, Japan*

The term, Lab-on-a-Chip, has become popular in the last decade. Lab-on-a-Chip is also called Micro Total Analysis System, and it refers to the attempt to do chemical analysis, which has been performed on a large scale so far, on a small chip instead. A miniaturized device, which is used for chemical analysis, has tremendous advantages in terms of speed, throughput, and sample consumption.

The main objective of this research is to realize the separation of biological molecules, such as peptide, into its constituents on a small device comprising a network of micro-scale channels etched on a glass substrate. The fabrication methods of the microfluidic device, the separation techniques, and the separation performance of the device will be presented.

**Poster Presentations**  
**Family Room of the Wyoming Union, University of Wyoming Campus**  
**4:30 – 6:30 PM, April 26<sup>th</sup>, 2008**

Brady Adams	Power Nail Puller.
Shawn Allred	Design of a Variable Pressure Gradient Wind Tunnel.
Tyler Andersen	Electrolysis Unit for Hydrogen Production.
Jason Anderson	South Water Reclamation Facility: Erie, CO
Kim Anderson	Reverse Safety Module.
Christine Aneiros	Renewable and Nonrenewable Body Products: The Commodification of the Self.
Andrew Asquith	Manifestation Of Mood & Anxiety Symptoms Among Behavioral Inhibition & Activation System (Bis/Bas) Scores.
Jacob Bernatow	Renewable and Nonrenewable Body Products: The Commodification of the Self.
Carl Bernet	Prototype Paintball Turret.
Barry Blaha	Prototype Paintball Turret.
Jamin Blatter	Motivation vs. Cognition: Examining the Processes Implemented in Worldview Defense.
Lady Botchway	Antibiotic Production in Wyoming Soil Actinomycetes.
John Brooks	The Impact of Self-Construal Priming and Social Network Homogeneity On Attitude Stability and Change.
Jeanette Buelt	Implementation of GIS at the Rocky Mountain Oilfield Testing Center.
Joe Buss	Adaptive Traffic Control on an Intersection.
Linus Callahan	Does Drug Court Participation Reduce Recidivism Rates in Drug Abusers?
Emily Cantrell	Electronic Residential Door Locking System.
Jianwei Chang	Is Your “Best Friend Forever” Bracelet or Anklet Killing You? A Longitudinal Study of Bacterial Numbers and Possible Pathogens on Woven Hemp Bracelets and Anklets.
Shiri Choresh	H.V.A.C. for I.D.E.S. Server Room.

Karen Cody	Relationship between parent and child physical activity levels during summer months. Comparison using subjective and objective measures of activity.
Alyssa Cooper	Automated Pill Cutter / Dispenser.
Luke Darnell	South Water Reclamation Facility: Erie, CO
Amanda Dunlap	Renewable and Nonrenewable Body Products: The Commodification of the Self.
Sean Dunlop	Design of a Variable Pressure Gradient Wind Tunnel.
Louis Engels	South Water Reclamation Facility: Erie, CO.
Chris Eyre	Adaptive Traffic Control on an Intersection.
Marc Eyre	Reverse Safety Module.
Brittany Fain	Human-Powered Transportation: The NASA Great Moonbuggy Race.
Zachary Frame	Power Nail Puller.
Chad Gagnon	Design of a Variable Pressure Gradient Wind Tunnel.
Heather Goss	Exile in Anglo-Saxon Texts.
Kevin Grauberger	Determination of Heart Cell Type and Subcellular Location of Arginase 2.
Robert Grogan	Balloon Satellite: Development & Design.
Nicholas Gurbhoo	Downhole Monitoring Device.
Jeremy Guzman	Environmental Issues: A Matter of Morality.
Jerry Hahn	Power Nail Puller.
Brenda Hansen	Invasion of the periphyton snatchers? A study of the impact of the New Zealand mud snail on a native snail in Yellowstone National Park.
James Harlan	Prototype Paintball Turret.
Eric Harvey	Preliminary Age Determination Of Unconsolidated Deposits On Top Of Table Mountain, Fremont Co., Wyoming.
Jami Harvey	NSAID inhibition of a kallikrein-like serine protease isolated from southern copperhead.

Jonathan Held	Balloon Satellite: Development & Design.
Christine Henschler	Renewable and Nonrenewable Body Products: The Commodification of the Self.
Justin Henshaw	Child Lift Wheelchair.
Jared Houfek	Human-Powered Transportation: The NASA Great Moonbuggy Race.
Deborah Hutchinson	Cellular phone etiquette: Reduction of ambiguous social norms through cognitive dissonance (CD) and technology-mediated communication (TMC).
Sarah Jacobs	Does Drug Court Participation Reduce Recidivism Rates in Drug Abusers?
Holly Jennings	Antibiotic Production in Wyoming Soil Actinomycetes.
Amanda Kaiser	Effect of Aflatoxin Exposure on Reproductive Potential of Immature Male Mice.
Daniel Kasmiskie	Frolfing Frisbee Finder.
Bryce Kelly	Electrolysis Unit for Hydrogen Production.
Thomas Kirkwood	Prototype Paintball Turret.
Carlie Koonce	Blood Lactate and Heart Rate Recovery in Exercised Horses.
Travis Lairscey	Electronic Residential Door Locking System.
Amanda LeClair	Experiences of Native American Students on a Predominately White Campus.
Heather Lucero	Electronic Residential Door Locking System.
Robert Marion	Power Nail Puller.
Sage McCann	Microbial Diversity at Hot Springs State Park, Thermopolis, WY.
Daniel McCarthy	Communication Device for People with Hearing or Speaking Limitations.
Earle Mock	Child Lift Wheelchair.
Jerry Moore	Adaptive Traffic Control on an Intersection.

Jon Ngai	Communication Device for People with Hearing or Speaking Limitations.
Matthew Orr	Trike Bike Redesign.
Beau Gregory Palmquist	Automated Insulin Dosage Device.
Abbie Patik	Nonverbal Social Behavior of Depression in Adults with Mild Intellectual Disability.
Matthew Price	Child Lift Wheelchair.
Charli Raben	The Effect of Parental Literacy Experiences on a Child's Literacy Practices.
Joe Reed	Localization of the PilZ domain from the BcsA protein within Escherichia coli.
Bryon Riotto	Design of a Variable Pressure Gradient Wind Tunnel.
Kevin Ritter	H.V.A.C. for I.D.E.S. Server Room.
Andrew Robbins	Human-Powered Transportation: The NASA Great Moonbuggy Race.
Kyle Ryff	Effect of nuclear factor kappa-B inhibition on Alzheimer's Disease-evoked neuroinflammatory response in a transgenic mouse model.
Lori Sandberg	Aiding the Disabled.
Matthew Scarborough	South Water Reclamation Facility: Erie, CO.
Tyler Smits	South Water Reclamation Facility: Erie, CO.
Teri Sones	Enhanced Tunneling Magnetoresistance and High-Spin Polarization at Room Temperature in a Teflon-Coated Fe?O? Granular System.
Sheanna Steingass	Looking Back and Moving Forward: The 2004 Tsunamis and their Impact on 21 <sup>st</sup> Century South India.
Kara Sutton	Does Drug Court Participation Reduce Recidivism Rates in Drug Abusers?
Heather Talbott	Gonadotropin Releasing Hormone Receptor mRNA Expression in the Murine Cerebellum.
Heather Talbott	Effects of Deslorelin on Murine Cardiac Tissue.
Dane Taylor	Reverse Safety Module.

Levi Van Buggenom	NSAID inhibition of a kallikrein-like serine protease isolated from southern copperhead ( <i>Agkistrodon contortrix contortrix</i> ) venom.
Joseph Van Court	Automated Insulin Dosage Device.
Erica Weber	Automated Pill Cutter / Dispenser.
David Wenig	Human-Powered Transportation: The NASA Great Moonbuggy Race.
Ashley Wing	Does Drug Court Participation Reduce Recidivism Rates in Drug Abusers?
Shanna Wolff	The Isolation of Antibiotic-like Proteins from Insect Larvae of <i>Musca domestica</i> , Housefly Maggots, and Three Other Species of Insects.